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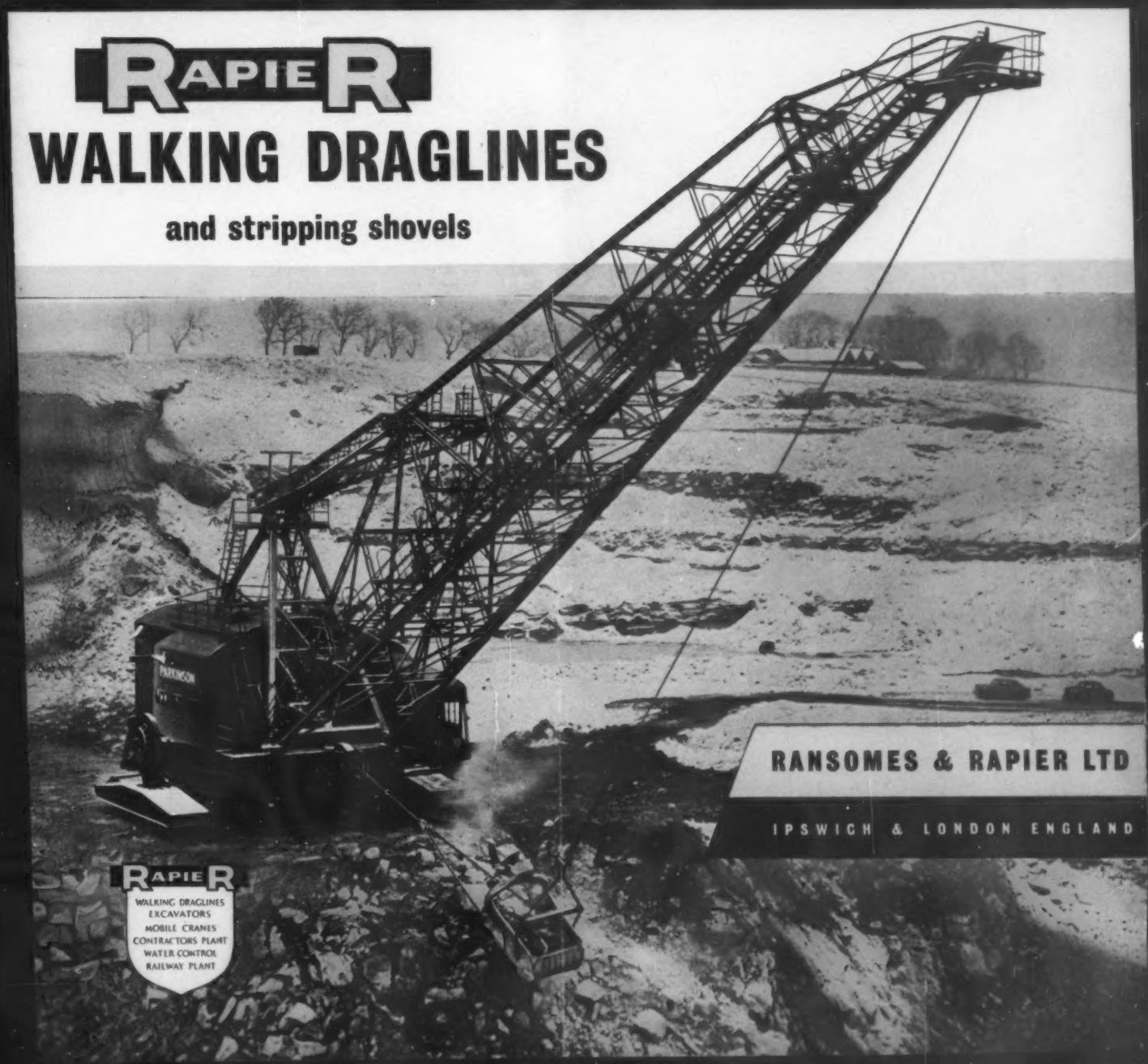

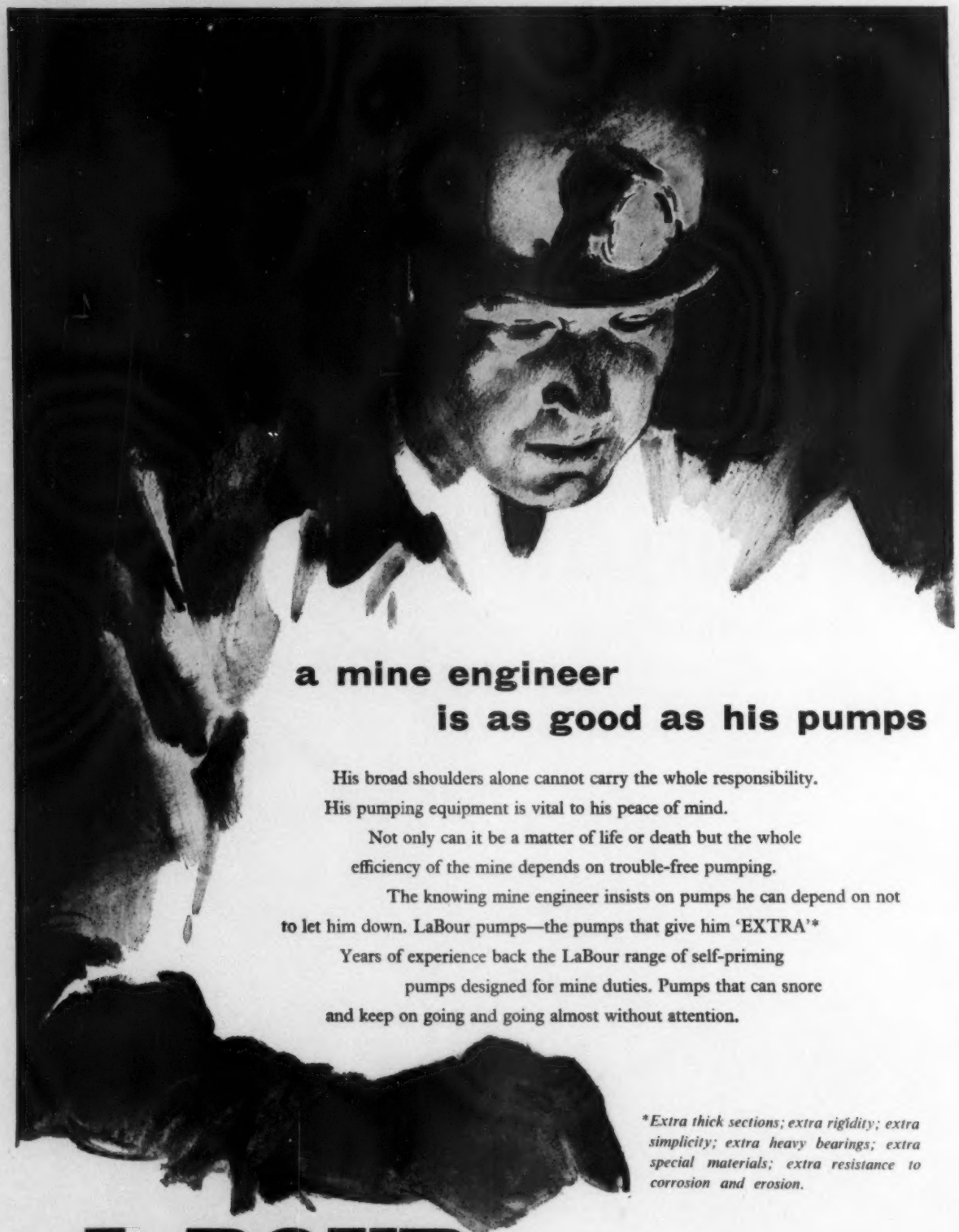

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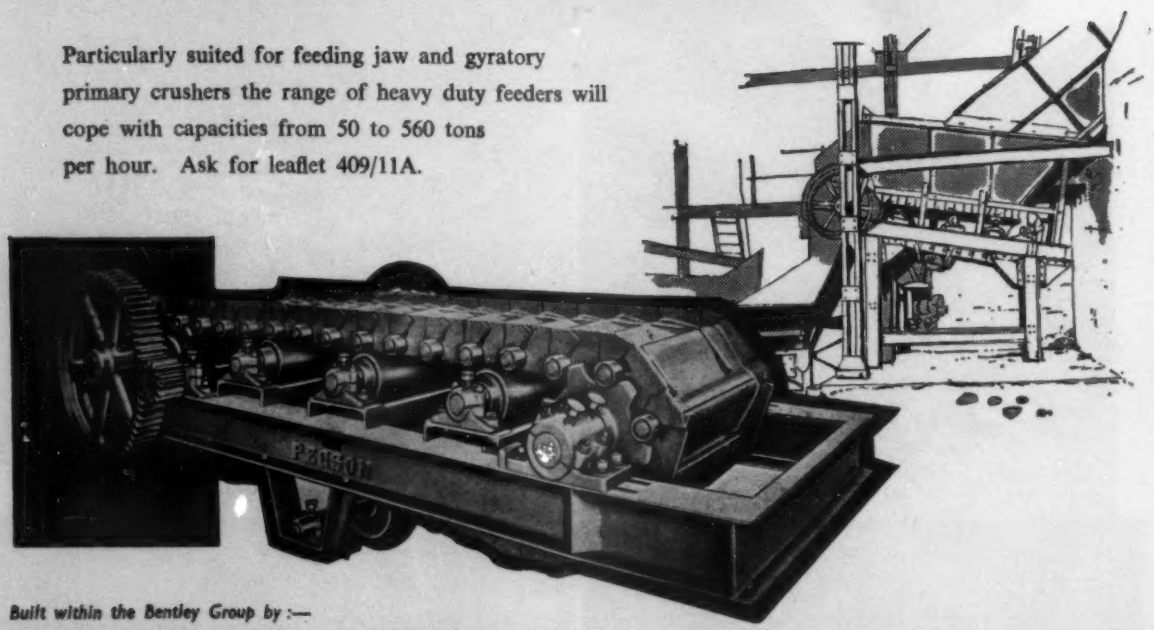

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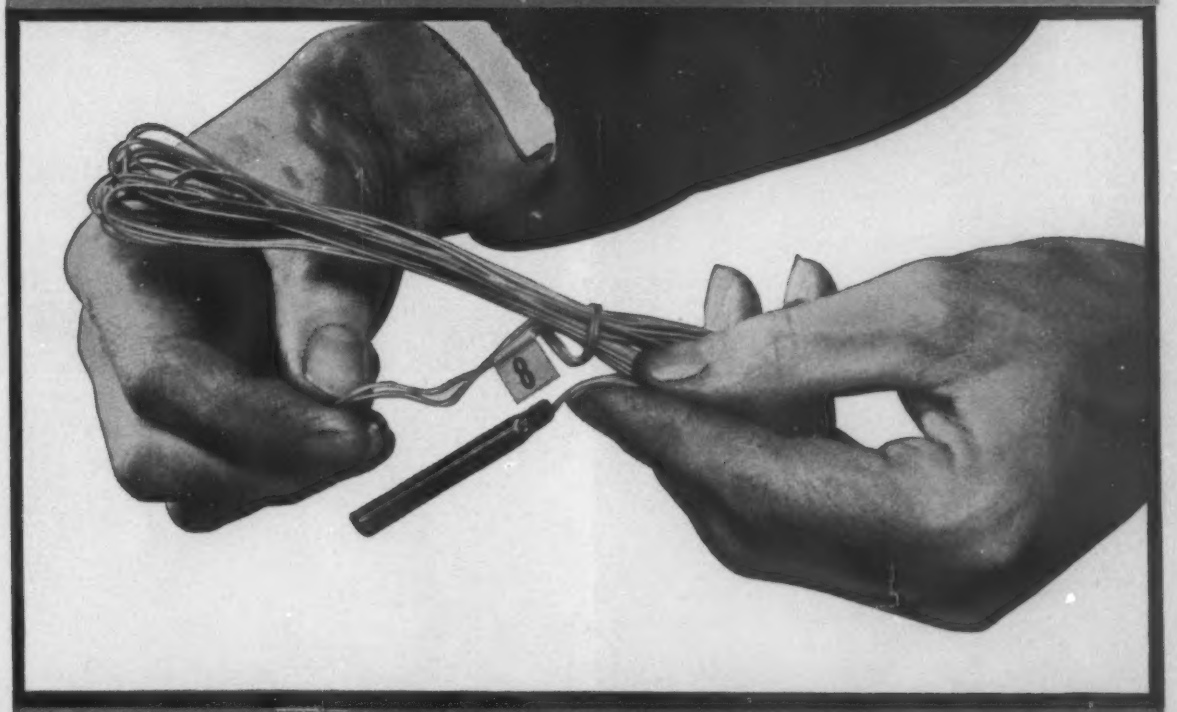

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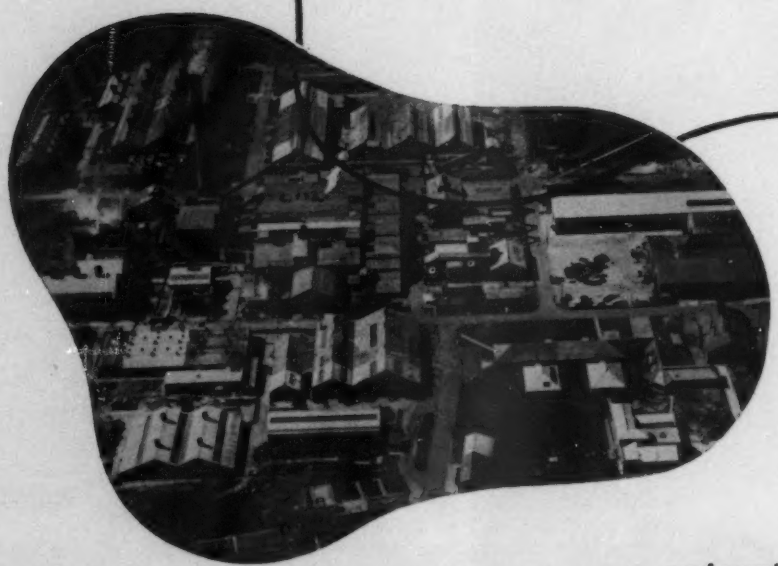

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Does Trade Follow the Aid?

EVENTS both at the Montreal Commonwealth conference and more recently at the New Delhi meetings point conclusively to the growing tempo at which financial aid is likely to be forthcoming from the wealthier countries of the West for the economic advancement of the underdeveloped areas of the world.

It seems inevitable that aid of this kind, much of it designed to strengthen the economies, and consequently the political independence, of countries which might otherwise fall within the Communist orbit, will increase greatly in the years ahead, just as Moscow, and perhaps later on Peking, can be expected to raise their counter bids.

Moreover, much of this aid will be spent on the development of mineral resources—that most basic of all requirements to the world at large, no less than to the economy of a country in its early stages of industrialization. Indeed, whatever may be the immediate market outlook for many of the metals, there are very few which, in terms of world requirements, will not call for expanded production facilities within the next decade, while further ahead the requirements can be expected to expand at a rate unprecedented even in terms of our experience since World War II. Moreover, with the countries of Europe, as well as the U.S.A., being now "have-not" countries, or at best heavy net importers, for most of the industrial metals, it is to the underdeveloped areas of the world that we must increasingly look to expand the world's mineral supply.

In these circumstances it is pertinent to consider whence will come the vast amount of mining machinery and equipment for the new projects needed to sustain, let alone advance on, existing productive capacities. In some of the politically uncommitted countries of crucial political importance in the Cold War, the Communist *bloc* has already shown itself ready to make mining machinery available on very favourable terms as well as to provide facilities for local manufacture. For some years to come, however, such exports can only continue to be made at the expense of hindering economic expansion within the Iron Curtain countries themselves. They are, therefore, only likely to be made available as a matter of political expediency, and probably on a scale more limited than would appear from the accompanying propaganda.

Among Western countries, however, there will be no such difficulty about relative priorities—at least while the present recession persists. Thus, interest centres rather on which country will prove the most successful in securing orders for mining machinery from those countries freshly endowed with financial aid.

Under present conditions of strong international competition for these new markets alike from economic and political motives, the spearhead of export engineering sales *must* be the sale of know-how. This emphasis gains increasing significance as each underdeveloped area becomes more and more able to manufacture at any rate part of its own industrial requirements. In such circumstances the consultant can, after advising in detail on the plans for a new mining project, show how a growing country can best utilize

its own resources in equipping the mine and beyond that can advise on where the remainder of the equipment—usually the more complex items—can best be obtained from abroad.

Other things being equal, the manufacturers in the country supplying this initial technical aid are advantageously placed to tender for whatever equipment has to be imported if only because of the long-standing personal connections which must exist between the consultant and the manufacturers in his own country, which tend to result in his closer familiarity with the performance and suitability of the alternative products they can offer.

This would be well enough if British technical know-how were being employed in anything approaching proportion to the financial aid being made available from British sources either directly, or indirectly, through Commonwealth institutions, the World Bank and other international channels for "aid" projects. Such, unfortunately, does not appear to be the case. Moreover, manufacturers, who are now coming to examine the overseas mining industry more closely (and many of them have hitherto been largely pre-occupied with the somewhat unpredictable requirements of the N.C.B.), are surprised to find independent British consultancy in this industry at a quantitatively very low ebb.

Indeed, manufacturers might be excused for wondering at first sight whether, in its present emaciated form, the profession could even be reasonably expected to provide for Britain a full share of the supply of technical aid in those countries to which they must look for new markets. On closer investigation, however, they would find that even the few firms now in consultant practice are by no means overwhelmed with work.

We have thus a vicious circle. Not enough British know-how is going into the planning and development of mining in the underdeveloped areas, which offer the biggest future mining machinery markets. On the other hand, if the know-how were to be called for on a scale commensurate with Britain's status as a major industrial country having a long record of successful overseas mining development, our consultant resources would soon be over-committed.

Just how this problem is to be resolved, we examine in greater detail in an article entitled, "Mobilizing the British Mining Consultant", commencing on the opposite page. This is a matter of vital concern, not only to all those already associated with the mining industry (both at home and overseas), whether as operator, consultant or supplier. Even more, it should be concerning those in Whitehall and in the City upon whose shoulders falls the responsibility for ensuring that the financial aid which Britain channels abroad into countries both inside and outside the Commonwealth is not only directed to where it will do most good in terms of Britain's political influence and the economic advancement of the country concerned, but also that the manner of its spending shall be such that British industry shall have the opportunity of supplying the know-how and machinery required by the "aid" countries.

Evidence of British technical ingenuity and industrial skill provide in the long run a far more eloquent and lasting reminder of this country's strength and friendly intentions than can any bank credit, the impact of which is in inverse proportion to the rate at which it is spent. Moreover, since, to a considerable extent, it is the British taxpayer upon whom the ultimate burden of these loans must fall, he has every right to expect that the real cost of these capital exports shall be kept to a minimum through the maximum consequential benefit to Britain's export trade.

From the standpoint of British exports, mining machinery, of course, means *any* mining machinery made in Britain. Obviously, much machinery of foreign design is made here under licence, just as British designs are manufactured abroad.

WILL THE COPPER PRICE HOLD?

The buoyant tone of copper shares, which has been accompanying the higher price of copper, appears to be based on some misapprehension as to just what is happening to the copper market.

The underlying strength of this market has, of course, been much increased as a result of the substantial production cutbacks effected by most of the big producers during the past year and, with American buying interest apparently picking up, users' stocks are now at more normal levels. Supply and demand were, in fact, pretty much in balance until the shutdown on the Copperbelt occurred five weeks ago. Moreover, so far as concerns the outlook for the Copperbelt producers themselves, there is no reason to think that, short of the strike continuing for many more weeks, the production losses cannot be made good within the next twelve months, more especially since the Copperbelt as a whole has been working on a reduced level of output.

On the other hand, the bulk of Rhodesian copper finds its way to Europe, so that once present pipeline stocks from the Copperbelt have run out, British and Continental users are going to find themselves short of copper from one of their principal normal sources of supply. Whereas stocks of copper in Europe are not large, American producers have built up considerable surplus stocks over the past two years or so. To attract these supplies to Europe it will be necessary for the L.M.E. price to rise sufficiently above the New York price to make shipments profitable. It is this situation which has brought about a recent sharp increase in L.M.E. prices, but it has also caused an increase in the American export price which today is about on an equality with the L.M.E. three months' price.

The questions which the investor in copper shares, no less than the copper purchaser, must ask themselves are, therefore, two. In the first place, how high is the American producer likely to screw up the price at which he is prepared to allow his stocks across the Atlantic? In the second place, when he does decide to let them go, will he, once he starts, sell as much as he can wherever he can, as on certain occasions in the past, or is he now going to demonstrate a growing *finesse* in international marketing?

With supply and demand in fair balance, it should be possible for the U.S. producer within limits to determine the price at which he wishes to hold copper and stabilize at that by feeding Europe at an appropriate rate. In practice this is an operation calling for the highest marketing skill, more especially as copper will be finding its way into the European market from other sources, too, as the price rises. Moreover, the operation can, in any event, only be a relatively short-term one, as sooner or later Rhodesian copper will start flowing on to the market again.

All in all, we would say that the present price level, while it could well go higher in the immediate future if the Copperbelt strike continues, is in danger of slumping suddenly, if only temporarily (to perhaps no better than £200 per ton), unless the American producer, once he starts selling, sells to Europe with considerable restraint. In the long term, this situation will, of course, right itself and there is no reason to think that the present L.M.E. three months' price of £230 will seem particularly unrealistic in six months' time.

Mobilizing the British Mining Consultant

In this week's leading note we have sought to emphasize the importance of the mining consultant as the spearhead of Britain's mining machinery exports. Independent consultancy in foreign countries, no less than in other parts of the Commonwealth, is widely practised today, and offers contacts of which the British manufacturer is doubtless making all possible use. In this article we are, however, concerned essentially with the insufficient use being made of the British mining consultant, whose activities, if more widely mobilized, could so greatly assist the British manufacturer. In the context of this country's export effort, British mining machinery manufacture must, of course, be defined as the manufacture of any mining machinery in Britain. Much of this is of foreign design, manufactured under licence, just as much British designed machinery is now being manufactured abroad.

HISTORICALLY, it was the independent consultant who laid the foundations for Britain's large overseas mining industry which has contributed so much to the economic growth of the Commonwealth. The progressive financial integration, which has taken place in this industry over the past fifty years, and which has produced the big mining houses of today, has, however, also had the effect of largely absorbing the independent consultant within these organizations and at the same time to some extent of changing the species. There may be argument as to how far this process may have tended to quench the fine flame of professional independence, but there can be no room for doubt that it is to this trend that we must attribute the near extinction of independent practice.

Within limits this trend towards resident consultancy worked satisfactorily both for the mining group and the manufacturer, so long as the manufacturer's markets corresponded fairly closely with those areas of the world in which Britain's mining finance houses were mainly operating. These traditional markets, are, however, gradually ceasing to be those upon which the British manufacturer can primarily depend, as the countries in which they are, have been rapidly developing their own domestic engineering industries, often from the initial stimulus of a flourishing mining industry.

The new markets to which the British manufacturer must now increasingly turn are those provided by the underdeveloped areas of the newer Commonwealth countries and of the politically uncommitted countries of the world. In many cases, the political risks and legislative haze surrounding the issue of mining leases and the taxation of profits make these areas totally unattractive to a mining finance house. Yet these are more often than not the areas to which, on grounds of national policy, the new style financial aid is going to flow—aid from which new or expanded mining industries will arise dependent sometimes almost wholly on imported machinery and equipment. It is, therefore, vital that somehow British technical aid should, through the medium of the independent consultant, be readily on offer in all cases where the conditions, on which the financial aid has been granted, do not automatically exclude the use of British consultants.

At this point we are confronted with the anomaly that, whereas the very few independent consultants in practice are not currently overwhelmed with work, yet if British technical aid were to be called upon at least in proportion to the extent of the present, and still more of the prospective, level of British financial aid in its various direct and indirect forms, it is apparent that existing consultancy services would be inadequate to cope with the amount of available work.

What our Consultants are up against

The causes of this anomaly are not difficult to identify. Leaving aside those aid loans with strings (mainly American and Russian) which call more or less specifically for the employment of know-how and manufacturing capacity from the country making the loan, the instances where British mining consultancy fails to sell its services can in the main be attributed to three causes.

In the first place, Britain stands almost alone among the industrial powers in that her independent consultancy services have always to pay their way in overseas markets. In France, in Germany, in Russia—and also on occasion in the United States—these services are frequently offered on a subsidized basis to the country receiving financial aid.

Sometimes, as in France, the subsidy can take the form that the consultancy services are provided by a semi-government agency (Sofremines), in Germany the consultancy services are often part of an integrated service offered by a manufacturing group so that part of the cost of the service can be spread over the manufacturing costs, while in Russia losses on the export of services no less than of goods can be written off to political account.

In the United States, the Bureau of Mines, which has a large and efficient foreign division, is itself a government agency providing an official technical link between the Administration's foreign policy and the mining industry, and although the Bureau does not apparently undertake foreign consultancy work itself, the close links which exist between this agency and the independent mining consultant may well indirectly make possible the underwriting of the latter's fees where it is thought politically expedient for American aid to be retained.

Aid Without Technical Supervision

The second cause of this anomaly is quite simply that at the present time much of the financial aid to the underdeveloped countries—and this applies by no means only to Britain's contributions—is being dissipated through the inadequate use of technical aid facilities from any country. Partly this is perhaps due to the fact that consultancy services are expensive to buy and have been insufficiently budgeted for in the aid programme; partly, however, it arises from national susceptibilities.

Practically any consultant with experience in these aid countries can cite cases where the efficiency of the project has suffered in operation either from failure to use, or from the misuse of, consultants or from the failure to recruit competent foreigners to senior executive positions in the new enterprise until such time as nationals of the country can be adequately trained. This is a matter to which officials of the World Bank are seemingly very much alive, and it is high time that the British government laid down much more specific conditions regarding the technical efficiency with which projects were undertaken under government aid programmes. It should not be difficult to arrange for loans to be payable in instalments subject to progressive technical reports being satisfactory.

The third main cause of British consultants failing to get retained arises from other countries, in their respective ways, having apparently contrived that a much more effective liaison exists than in Britain between those negotiating the

financial aid and those in a position to supply the technical aid. The links between the U.S. Bureau of Mines and other branches of the Administration in Washington, those between "Sofremines" and the French Government and banks, and the situation inherent in the Russian political set-up, all in somewhat different forms provide this liaison, and ensures that consultants in these countries often come to hear of new projects earlier than we do in Britain.

No such formal machinery exists in Britain. Indeed it would almost appear as if the conception of financial aid in Whitehall has in the past been limited to the provision of credits and that there has been little or no follow-up either to ensure that these credits were expended in a reasonably efficient manner to the maximum advantage of the receiving country, or that British industry thereby benefited to an extent which would reduce to a minimum the real cost of such aid to the British taxpayer.

On both these counts it is obviously of vital importance that the mining consultant—as indeed the consultant in all branches of engineering—should be kept much more closely in touch with Whitehall's intentions and with the thinking of the bankers and outside advisers who are to be found serving on British financial missions or indeed who, at least in the case of Britain's foreign banks, are themselves initiating loans as part of the normal banking process.

In this matter, the initiative must come from Whitehall and from the City. Here are to be found the people who have fore-knowledge of impending financial negotiations and who should be primarily concerned, first that the prospective loans should be of maximum benefit to the recipient, and secondly that British industry should get its full share of consequential purchases. So far as Whitehall is concerned, the Commonwealth Relations Office, the Foreign Office, the Colonial Office and the Crown Agents for the Colonies, as well, of course, as the Board of Trade and the Treasury, are all concerned with this problem together with whatever inter-departmental group is concerned with the overall projection of Britain's political and economic influence in the world's politically uncommitted areas.

What is Needed

The machinery of liaison need not be costly or cumbersome. It should be sufficient to establish a small co-ordinating secretariat which would assess progressively the likely extent of coming opportunities for British mining consultancy and to keep the profession fully informed of the details and imminence of these prospects. It could also relate this data to available personnel so as to be able to give advance warning to the profession as to the periods at which and the extent to which existing personnel were likely to be insufficient. (Naturally, if such a secretariat were set up for all branches of engineering consultancy, the cost could be spread more widely.)

If we have read the position aright, such a forward assessment would throw up a prospective shortage at an early date and, as well as giving advance warning to existing firms, this information might well stimulate the re-creation of additional mining consultancy firms. A prospective shortage is particularly likely to the extent that technical aid is provided for the industrially most backward areas. In these cases, even a single contract could immobilize half a dozen or more mining engineers from a consultant's staff simply because in the early stages of the development of a new mining industry there just are not sufficient qualified men available from within the country to see the project efficiently launched. Thus where a similar contract in Europe or South Africa might be no more than a matter of consultancy, in, say, one of the poorer Far Eastern countries the consultant has, at least in the early years, sometimes even to provide the senior mine management, in the guise of consultancy, until suitable nationals can be trained to take over.

More British Consultants

The question of how the ranks of the independent British mining consultant are to be swelled is thus no academic one. The problem is not made any easier by the fact that the volume of technical aid consultancy is liable to fluctuate quite sharply. Projects can get delayed, maybe for years, at the level of political and financial negotiations and then, when a clearance has been given for the financial aid, the country concerned is naturally going to expect prompt technical assistance, and will quickly look elsewhere if it is not forthcoming from Britain.

On the other hand it takes time to train a mining consultant. Not only are many staff engineers temperamentally unsuited to this class of work, but considerable experience as a " number two " is necessary before a man can be given the handling of a consultancy contract on his own responsibility.

The solution would therefore seem to lie in two directions. First in extending the number of mining engineers at present in private practice, and secondly in providing for the periodical overload by having other engineers and geologists on call. This latter facility could perhaps best be achieved through co-operation both with government agencies such as the Directorate of Colonial Geological Surveys and the National Coal Board, and also with the individual private mining houses. The possible clashes of interest in such co-operation are obvious and there is always a danger of the most expendable man being made available. It would, therefore, be necessary for the priorities of national interest to be clearly determined in Whitehall and then explained at top level to those organizations upon whose assistance the implementation of these priorities was dependent.

On the other hand private industry in Britain has an understandable disinclination to become involved in government enterprises, and it should, therefore, be made very clear that there is no question of Whitehall " moving in " on British mining consultancy or on the overseas mining industry, but that it is merely seeking to provide the essential liaison and advance information without which British consultancy cannot be offered at the right time and in the right place.

Pricing Their Services

There remains the question of British mining consultancy being offered at the right price; at a price, that is, acceptable to the country receiving aid. This is, perhaps, a further matter upon which the secretariat might usefully advise. In cases where the loans are entirely within British control it should be possible to write in a provision for adequate consultancy services on an economic basis ; but where British consultancy must compete with subsidized services from other countries, it is clearly a matter of prime concern to all that the offer should not be rejected on considerations of price. In such cases, it should surely be as much part of British foreign policy to enable the consultant to quote a competitive fee as it is to spend further money on, say, the British Council or the B.B.C.'s overseas services.

An Idea for the Mining Houses

It may, of course, well be that to some of the great mining finance houses, which control Britain's overseas mining industry, the kind of emergency aid to the independent consultant, which we have suggested, will not appeal. If

this is so, such a group might well consider the alternative of itself entering the professional consultancy field, either directly or through the establishment of a subsidiary consultancy company. Such an arrangement might well give the group greater strength and stability in its own consultancy and central planning departments. Just as the demand for technical aid is going to fluctuate, so are the requirements for consultancy services within a large group, and it could well be that the establishment of a consultancy unit within the group—open to accepting outside work (even if only in areas financially unattractive to the group itself)—might add to the stability of this section of the group's operations and enable it to maintain a larger permanent senior staff.

Given that the demand for British mining consultancy can be stimulated effectively to the extent that we envisage, the mining houses will in any case have to choose between loaning their personnel or going into outside practice themselves. Otherwise they may find themselves in serious danger of losing many of their best men to the resurgent independent consultants.

What is the Alternative?

Unless British mining technical aid can be injected into the economy of the country receiving financial aid at the initial stage and on some such basis as we have outlined, the outlook for the British mining machinery manufacturer in these newly developing overseas markets must remain very uncertain. If, therefore, those best equipped to provide this know-how do not one way or another take the initiative, some manufacturers may eventually come to consider the advisability of combining to provide such services themselves, and to do this they, too, would presumably have to raid existing mining organizations to obtain the necessary personnel.

Some of the larger engineering groups are already at the stage where they offer integrated consultancy, design, primary contracting, and manufacturing services within the limits of their own *expertise*, and it is not inconceivable that *faute de mieux* they might feel impelled to extend such services into mining consultancy itself. The experience of other countries, notably Germany, where engineering consultancy has been closely linked to individual manufacturers or manufacturing groups, strongly suggests that this type of solution is far from ideal, and we have little doubt that it is a solution to which the British mining machinery manufacturer would only turn as a last resort.

Moreover, if they ever were driven to do so, it is to be hoped that the group of manufacturers combining to sponsor a mining consultancy service would be sufficiently broadly based to offer so wide a range of mining products that the consultants could feel uninhibited in selecting on purely professional considerations the machinery and equipment most suitable for the job.

There is, however, no inherent reason why the manufacturer need ever be driven to this ultimate expedient, and it rests with those who are already performing the mining consultant's function both privately, in government service and in the big mining groups, to ensure that the necessity need, in fact, never arise.

Making Uranium Mining Safe

The following article, the concluding instalment of two, presents the conclusions drawn in U.S. Bureau of Mines *Information Circular* 7834, entitled *Engineering Control of Health and Safety Hazards in Uranium Mines*.

TO offset the radioactivity hazard, ventilating requirements of uranium mines usually should exceed those of ordinary mine operations and should have little relation to the number of men underground. Dust-control practices should be emphasized, because the dust is contaminated with radioactive materials. These include wet drilling, the generous use of water on muck piles during loading, and the wetting down of working places. Mine water, however, should not be used, unless it is known to be free from radioactive contamination; however, the remote location of many uranium mines makes use of copious amounts of water difficult. Adequate dust control is even more important in uranium mines than in other mines where the problem is only to suppress siliceous dusts. Dust concentrations in uranium mines have greater physiological significance, as any dust breathed into the lungs is contaminated with radioactive material.

Conclusions

Uranium mining can be made safe, and it is believed that the following actions should achieve this end:

1. Adequate mechanical ventilation should be provided so that the radiation level at any working place does not exceed 300 micromicrocuries of total radon daughters per litre of air and the atmosphere is kept free from harmful quantities of gases and dusts.

2. Stringent dust-control measures for preventing or allaying harmful quantities of airborne dusts should include wet drilling, the generous use of water on muck piles during loading, and the wetting down of working places. In mines where trackless loading and haulage equipment stir up much dust, good results can be attained by applying calcium chloride to the mine floor.

3. All concerned should be familiar with State regulations and should adhere to them.

4. All employees should be trained until competent to do their work in a safe manner, and only competent safety-minded supervisors should be employed.

5. Goggles, protective clothing, and Bureau of Mines approved respirators should be available and used when needed.

6. First-aid training and first-aid material should be provided, as well as a continuing safety programme.

7. Good personal hygiene should be practised by all workers. Daily baths and frequent change of work clothes are recommended. Eating and storing food in the mine should not be permitted.

8. All new employees should be given thorough physical examinations (including laboratory analyses of blood and urine and chest X-rays). Previous occupational and medical histories should be obtained. Follow-up medical examinations should be made annually.

9. Everyone engaged in uranium mining from top management down to miners should have a general knowledge of the radiation hazard and should know how to protect their fellow workers and themselves.

Mining Conditions

Above, excavation work in progress for a bulk sample of lignite. Below, in centre of page, a well flowing under artesian pressure in the Neiveli pilot quarry.

ALTHOUGH mineral resources and technical skills are not lacking in the Madras State, India, industrial development has been retarded, mainly on account of the shortage of power and indigenous fuels and it is to relieve this situation that the lignite deposits in Neiveli, in the South Arcot District of the state, are now being exploited.

Hitherto, the nearest coal available in Madras State has been mined 350 miles north of Madras City, which, itself, is practically at the northern boundary of the state and much of the limited supplies of coal coming into the state has to be brought from the Bengal and Bihar States, 1,000 miles north of Madras.

The Neiveli Story

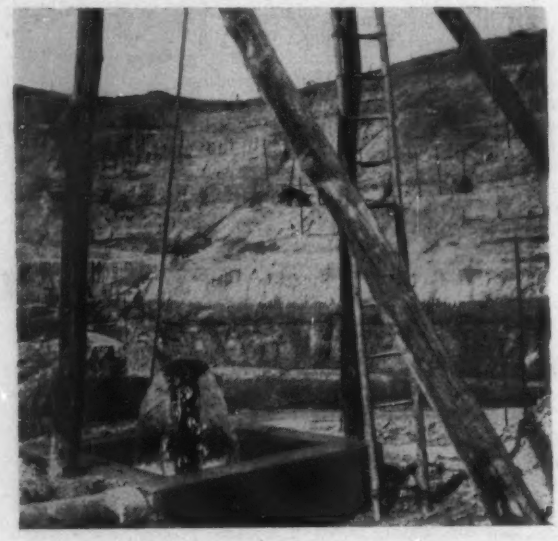
Lignite has been known to exist at Neiveli for some time, but more attention was given to its existence in the late 1930's, when drilling was undertaken for water supply purposes. Later, the Geological Survey of India carried out investigations and put down a number of bore holes in 1943-46, which revealed the existence of lignite over an area of 23 square miles. This led to further investigations and a series of bore holes were sunk during 1948-51, which proved the existence of reserves of lignite, estimated at 2,000,000,000 tons, over a total area of 100 square miles. The most favourable overburden-lignite ratio and the more easily workable deposits, amounting to 200,000,000 tons, occur in an area of about 5½ square miles, at more or less the centre of which a mining scheme was inaugurated by the Prime Minister of India in May, 1957.

The thickness of the seam in this area, which is the first to be worked under the project, varies from 0 to 89 ft., with an average of 55 ft. and it occurs at a depth of about 180 ft. below ground level.

Unfortunately, a number of very high pressure artesian aquifers exist below the lignite. These have created a problem unique to Neiveli, since it is believed that such a situation does not obtain in conjunction with lignite deposits in any other part of the world. The artesian water below the lignite exerts an upward thrust of about 6 to 8 tons per square foot (93 to 124 lb. p.s.i.). In areas above sea-level, such as that to be worked first, the artesian water rushes up in the hole to its static level of 100 ft. above mean sea-level, or about 60 ft. below ground-level, as soon as a hole is bored down to the base of the lignite at about a depth of 235 ft. Where ground-level is nearly equal to or a little less than the static level, the water will flow out of such a bore hole.

Since there is no impermeable barrier of sufficient thickness below the lignite bed to withstand the pressure that would be exerted on the base of the lignite on the removal of the overburden, there is a risk of the artesian water heaving upwards, bursting through the lignite seam and flooding the mine, unless its pressure is kept continuously under control from the appropriate stage of mining operations.

Since underground mining was quite out of the question, the Madras Government, with aid from the Technical



Co-operation Mission of the United States, arranged through the Government of India, undertook the excavation of a pilot quarry to determine the engineering feasibility and economic practicability of open-cast mining.

Excavations were taken down to 145 ft. below ground level by December, 1954. These indicated that open-cast mining would be practicable, but further work had to be stopped, pending a detailed study of the ground-water problem. No specific project was contemplated as a result of the investigations, but, in the meantime, the Government of India, had arranged, under the Colombo Plan, for the services of Powell Duffryn Technical Services Ltd., consulting engineers, to prepare a definite project report on the mining and utilization of the lignite.

Such a report was presented in November, 1954. It proposed a number of specific alternative schemes and suggested further investigations to check the thickness of the lignite seam and also to evolve an efficient and thoroughly dependable system of ground-water control. Tests and analyses abroad, in well-known laboratories, of bulk samples of the Neiveli lignite were also suggested.

Since the magnitude of the project was, by now, beyond the capacity of the Madras Government, the Central

By JOHN GRINDROD

In The Neiveli Lignite Project

The cost of the Neiveli lignite project in South India, which was originally estimated at Rs. 669,000,000 is now likely to go up to Rs. 750,000,000. The lignite project envisages the mining of about 3,500,000 tons of raw lignite per year, the setting up of a large thermal power station of 250 mW using lignite as fuel for steam generation, a fertiliser unit for the manufacture of nitrogen fertilizer with a nitrogen content of 70,000 tons per year in the shape of urea only and a briquetting plant for the manufacture of about 380,000 tons of carbonized lignite briquettes. The thermal station will be set up under the Soviet Union 500,000,000 rouble credit.

Government took over financial responsibility as from 1st January, 1955, and it was decided to adopt and further investigate one of the projects put forward by Powell Duffryn Technical Services Ltd. This involved an integrated project for mining 3,500,000 tons of lignite per annum and its processing and utilization for the generation of 200mW of electricity, the production of nitrogenous fertilizers with a nitrogen content of 70,000 tons a year, and the manufacture of 720,000 tons of raw lignite briquettes and their carbonization to produce 380,000 tons of carbonized briquettes, furnishing smokeless domestic fuel, and a number of valuable by-products. The pilot quarry was excavated a little further and a shaft was sunk with care to a depth of about 15 ft. from the top of the lignite.

As a further downward extension of the shaft would have been risky, galleries were excavated laterally from the shaft and a bulk sample of 50 tons of lignite removed and sent to laboratories in Western Germany for detailed analyses and tests. These confirmed that the lignite as mined had a moisture content of about 50 per cent, volatiles amounting to 25 per cent, 22 per cent of fixed carbon and an ash content of only 3 per cent, the heating value of the lignite being about 5,500 B.T.U. per lb. These results revealed a quality of lignite better even than that found in Western Germany.

A series of new bore holes confirmed the previous estimates of reserves. In the meantime, the Central Government of India took over the administrative responsibility for the project as from 15th September, 1955.

Countering Artesian Water

Risks of artesian water flooding had to be made at least negligible, and the drilling of large diameter pump wells, hitherto unknown in this part of the country, was undertaken. Pumps were installed and large-scale pumping tests carried out. These were successfully completed at the end of June 1956 and they proved that the pressure surface of the artesian water could be reduced to a safe level below the lignite by pumping from a carefully designed pattern of wells, most of them round the mine and some within it. The Indian Government subsequently approved the project as a whole and sanctioned the execution of the mining scheme, which by itself was expected to cost about Rs. 20 crores. The cost of the entire integrated project is estimated at Rs. 75 crores and it was planned to take about five years to complete. Shortage of foreign exchange will, however, delay the implementation of certain sections of the project. The lignite is expected to cost not more than Rs. 10 per ton and the cost of raw lignite equivalent to one ton of coal in thermal value would be only about Rs. 25, compared with the cost of Rs. 45 to 50 per ton of coal delivered in Madras by rail and Rs. 70 to 80 for rail-cum-sea-borne coal.

To enable the project to be operated as a commercial venture a Government-owned company, known as The Neiveli Lignite Corporation (Private) Ltd. was created in December, 1956.

The Mining Pattern

In order to secure a steady output of lignite the first mining area of 5½ square miles containing about 200,000,000 tons of the more easily mined lignite was divided into a number of sectors. This division was made with reference to the quantity of lignite expected to be available in each sector, on the basis of the borings already put down ; the overburden-lignite ratio ; and the nature of the overburden. Each sector will be worked in turn according to a definite plan, minor variations being made, where necessary, with reference to further trial bores which will be put down as mining advances.

The scheme consists of two phases, a development phase and a production phase. During the former, the first mine cut in the first block to be worked will be 6,100 ft. by 950 ft. at the top, with three benches leading down to the lignite. At the end of this phase, when adequate quantities of lignite will be exposed, 27,000,000 cubic yards of the overburden should have been removed and placed in a spoil heap outside

Part of the fleet of 36 Caterpillar DW20 units with W20 wagons, 16 Caterpillar D8 tractors and four Euclid elevating loaders that were used in the initial earthmoving operation at Neiveli.

the lignite-bearing area. The overburden removed during the production phase will be filled back, in the areas already worked, by means of a belt conveyor system assisted by slewable spreaders. Mining will follow the pattern adopted in German and Australian open-cast lignite mines.

Specialised mining machinery, including bucket-wheel excavators, slewable spreaders, belt conveyors, etc. have been ordered at a cost of about Rs. 4 crores. Orders have also been placed for additional mining machinery, with short-dated delivery, at a cost of about Rs. 2 crores. In order to remove as much of the overburden as possible before the specialised equipment arrived and to prepare the benches for such equipment to work on, items of conventional earthmoving machinery costing about Rs. 1.5 crores were obtained, almost entirely from the United States.

Up to September 1958, about 5,000,000 cubic yards of overburden had been removed. Work was being carried out in two shifts of 8 hours gross each, a third shift being operated for maintenance only. Three loaders and two recently commissioned shovels, supported by 36 DW20 bottom-dump trucks and a number of bulldozers, etc. were being used. With this equipment 499,000 cubic yards of difficult overburden were removed in March last, this being the highest monthly output so far, though the tempo of the work is being gradually speeded up.

During the first six months of the production phase, beginning early in 1961, it is expected that quantities of lignite adequate for operating the first unit of the power station will be steadily won. Output should later be stepped up to meet the requirements of other schemes as they are progressively introduced. Full production is expected toward the end of 1961.

Under the groundwater control scheme 48,000 gallons of water a minute will have to be pumped out of the artesian aquifers, using 48 wells, in order to maintain the pressure surface of the aquifers at a safe level (requiring a drawdown of about 200 ft.) below the lignite in the mine, the dimensions of which at any time will be about 6,000 ft. long and 1,200 ft. wide at the top. The water will be utilized for boiler feed and cooling purposes in the thermal power station ; in the plant for washing the china clay removed during mining operations ; and the township of about 1,000 houses. Any surplus will be used for irrigation purposes. A reservoir, for storing surplus water, has been constructed.

Operational Equipment

Experiments are being made with different types of drilling equipment, well-screens and methods of construction of pump wells. Based on the results of these experiments orders for materials will be placed. Water control will become necessary when the critical depth is reached sometime in 1959.

Arrangements were made with the suppliers of the bucket-wheel excavators, and through the West German Government, for sending four key personnel to Germany, in August 1957, for training in the design, operation and maintenance of the more important and complicated items of the specialized machinery. Three other teams also visited Germany and other places in Europe in 1957 to study the mining and utilization of lignite. Other personnel will be trained at Neiveli itself by the supplying firms.

Powell Duffryn Technical Services Ltd. have been appointed as consultants for the mining scheme. Appropriate synchronization and co-ordination of the planning and the execution of the other constituent schemes, which together now make up a project of considerable national importance, will be dealt with by the Neiveli Lignite Corporation itself.

Safety in Poland's Mines

As a result of analysis of the accident in the Makoszowy colliery and of the experience of safety measures in Polish mines, special instructions have been issued introducing stricter regulations regarding the safety and hygiene of work in the coal industry.

A fire which brought tragic results broke out in the Makoszowy colliery in Zabrze on August 28. The fire started in the main ventilation shaft, which supplies air to the miners working at the 300 level and endangered the lives of the workers in these galleries.

Owing to the rescue work, in which several dozen rescue teams from neighbouring collieries took part, the majority of the miners were saved. Fifty-six miners perished from asphyxiation, however, while fifty-two miners suffering from gas poisoning had to be taken to hospital.

Investigations by the Prosecutor's Office established that the catastrophe was probably caused by a welder and his mate, who were welding directly before the outbreak of the fire in conditions prohibited by the regulations.

On September 1, there was a fire-damp explosion in the Nowa Ruda colliery in Lower Silesia. Its cause is not yet known. Seven miners were killed by the explosion, which caused a roof-fall cutting off a further seven miners. Government Commissions are inquiring into both the accidents.

Plans For The Future

The plans of the Ministry of Mining and the Power Industry for safety and hygiene in the collieries aim in two main directions. The first is organizational steps which, broadly speaking, will ensure constant and increased control of the collieries by the higher authorities and increased responsibility on the part of these authorities for what is happening there. The second is technical action, eliminating the potential sources of mining disasters.

Among organizational measures, the Ministry of Mining and the Power Industry is to issue orders that the posts of director chief engineer, mining works manager, chief mechanic and ventilation manager in the collieries can only be filled by persons who, besides scientific and vocational qualifications, have a good knowledge of the given colliery, of the layout of the mine, its galleries, etc.

Another no less important organizational step concerns the establishment of closer ties between the colliery and the higher supervisory authorities. The intention is to ensure the speedy and efficient mobilization of the appropriate persons and equipment essential for rescue work in the event of accidents. With this aim in view, there will also be changes in the regulations defining the duties of the dispatcher in the colliery.

Orders to be issued by the Ministry of Mining also remind the higher supervisory authorities of their duty to carry out control in the collieries throughout the whole twenty-four hours without a break. Sanctions for not observing these regulations will be made more severe.

Directors of collieries must, among other things, remember their duty to ensure the presence of supervisory teams in the various sections of the colliery, so that all work below surface is suitably controlled on each shift.

On the technical side, everything which may become the source of fires is to be removed from the collieries. Among other things, the Ministry will extend the prohibition of wooden structures, which applies to the building of new collieries to other mines. Such non-inflammable materials as iron, reinforced concrete, etc., will be used. It is recommended that every colliery should start the production of reinforced concrete props as a sideline.

Technical Briefs

Circular Concentrators in Ore Beneficiation

The Circular Concentrator, manufactured by the Cannon Concentrator Co., United States, was described in *The Mining Journal Annual Review*, May, 1958. Further details of this equipment are contained in a notice recently released by the manufacturers.

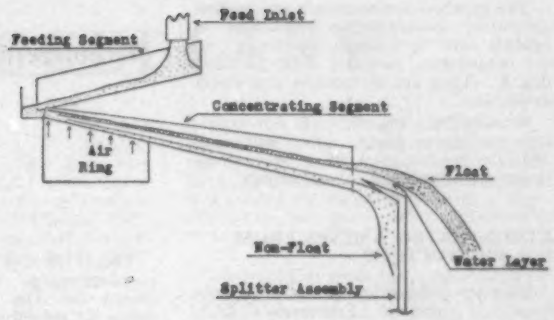
The primary application of the Circular Concentrator has been in the recovery of values from beach and dune sand deposits. This application can be extended to include beneficiation problems involving any —10-mesh placer material. The sands field in itself is very fertile and has posed many metallurgical and design problems. These problems have permitted the very narrow gap between sands and ground ores to be bridged. Test work has permitted evaluation of the effect of sharp, rounded and flaky grains of gangue and mineral with respect to metallurgy and the physical problems of feeding and handling ores of various natures. The opportunity has been taken to assess the effect of gangue or mineral slimes on concentrator action.

Work on metallic ores has been limited to date. Test work has been carried out on iron fines, fine low grade tungsten ore and fine coal. This work has shown the Circular Concentrator to be suitable for the beneficiation of such ores and coals.

An interesting outgrowth of the Concentrator has been the Flotation Circle. This device was developed primarily for the re-agentized separation of —16 or —20-mesh phosphate fines from the contaminating quartz. It is applicable, however, to any fast floating material. Feed distribution is from a central standpipe, into a feeding launder, and then to feeding segments.

A thin film of re-agentized feed at 15-20 per cent solids is passed across the air ring to the 48 concentrating segments. Low pressure air (25 c.f.m. and 8 in. of water) is diffused through the fabric of the air ring, causing flotation. Short, converging concentrating segments squeeze the float up and increase its velocity. Material that has been floated by the air ring is thus separated from the non-floats by a ¾ in. layer of water. A single adjustable circular splitter blade separates float and non-float (or concentrate and tails) by cutting in this water layer.

The majority of flowsheets in phosphate call for sizing of the —16 to —20-mesh material into a nominal 16 to 20/35-mesh fraction and a nominal 35/150-mesh fraction. These fractions are currently treated by agglomerate tabling or spiralling, and two-stage flotation respectively. The Flotation Circle development has been aimed at treatment of the gross —16 to —20-mesh fraction. This procedure permits elimination of the rather expensive sizing step now present in phosphate flowsheets.



Schematic section of one segment of the flotation circle, outgrowth of the Cannon Circular Concentrator

The attempt has been made to produce a clean tail and a concentrate high enough in grade to be suitable for clean up with amine flotation. This has been found practicable in plant tests where it was possible to obtain the total —20-mesh feed. In these tests, phosphate recovery ran as high as 94 per cent at feed tonnages of 10-12 t.p.h. The tailings were low enough in b. p. l. to be thrown away, and the concentrate was of high enough grade to go to amine flotation.

RADIO SCREENING OF ORE BEDS

A new method of geological prospecting, radio-screening of orebeds, has been successfully tested in the Soviet Union.

This method resembles X-ray with the difference, however, that short radio-waves ranging from 10 to 50 m. are used instead of the X-ray with their insignificant penetration. The new method is based on the different reaction to screening by various ores due to their specific electrical properties.

The U.S.S.R. Prospecting Techniques Research Institute has designed special radio equipment making possible screening in drilled wells at any depth. A transmitter and a receiving set are lowered in two neighbouring wells lying 200-300 m. apart. By moving both sets upwards and downwards the operators determine with a precision of 10 m. the outline and depth of the ore seams lying between the wells.

The transmitter and the receiver are enclosed in hermetically sealed cylinders with a diameter of 6-8 cm. and a height of 1.5 m. Each of them has an aerial directed downwards. A 20 watt transmitter is strong enough for screening a 300 m. thick seam.

FIELD ASSAY OF AURIFEROUS MATERIALS

The Report No. 553, C.S.I.R.O., Melbourne, states that semi-quantitative chromatographic method for estimating gold, suitable for field use, has been developed. The method is particularly suited to ores in which the gold occurs in particles too fine to be readily detected by panning.

Estimation is made by comparison with a set of standards. As originally developed, the method can be applied to siliceous ores; but it can also be applied to ores containing a low proportion of sulphides after preliminary treatment. Apparatus required is made up of readily available materials at reasonably low cost. Direct estimations of gold content can be made over the range 1 dwt. to 9 dwt. gold per ton; differences of 1 dwt. per ton can be distinguished. For samples containing over 9 dwt. per ton estimations may be made by suitably reducing sample size.

Using the equipment described, estimations may be obtained in two hours.

The results presented show that fine gold, as low as one and a half parts per million can be semi-quantitatively estimated in the field by dilute aqua regia extraction under slight pressure and developing in ethyl acetate solvent.

The apparatus is simple, portable and easily procured but while the time taken to complete an estimate of any sample is shorter than that of fire assaying, it is not intended as an alternative to standard practice. The advantage lies in the fact that a close estimation can be made in the field at low cost. It is pointed out that the method is primarily for siliceous material with gold which is too fine for panning but also has a limited application to sulphide ores.

SPECTROGRAPHIC DETERMINATION OF BERYLLIUM

Application of the usual chemical methods to the determination of beryllium in the mineral dressing products of a spodumene pegmatite was found, in U.S. Bureau of *Mines Report of Investigations* 5407, to be unsatisfactory as to speed, accuracy, sensitivity and range of analysis. A spectrographic method for the determination of beryllium is described in the report. Samples are ground, mixed with borax, high purity flake graphite, and an international standard. Then they are fused, reground, pelletized and excited with a high voltage spark discharge. Investigation of several spectrographic techniques to overcome matrix effects are described. The method developed gives results for beryllium in the concentration range from 0.002 per cent to 5.0 per cent. The average probable error of duplicate determinations was below 3.0 per cent of the quantity present.

NEW THERMOELECTRIC MATERIAL

Scientists of the Westinghouse Electric Corporation have discovered a new class of materials which can convert the heat of burning fuel directly into electricity. The substances, called thermoelectric materials, produce electricity without any moving parts.

The ceramic-type materials are the first solid-state thermoelectric substances to operate with "promising efficiencies" in the temperature range of 2,000 to 3,000 deg. F. They are inexpensive and easily available.

Westinghouse scientists did not anticipate that thermoelectric power will make obsolete present methods of generating large-scale quantities of electricity.

ETHOXYLATED AMINES FROM U.K. PRODUCTION

With the publication of technical bulletin L.25 entitled, "Ethomeen C/25", Armour Chemical Industries Ltd. announce the availability of the first of their ethoxylated amines from British production.

Ethomeen C/25 is a tertiary amine produced by condensing a primary coco amine with 15 molecules of Ethylene oxide and behaves as a non-ionic. It is, however, used sometimes as a cationic chemical, e.g. it forms quaternaries and other salts; or as an non-ionic, e.g. it is an excellent emulsifier. It is an amber liquid with a specific gravity of 1.042 at 25 deg. C. and an average molecular weight of 875. A 0.1 per cent solution of Ethomeen C/25 in distilled water at 25 deg. C. has a surface tension of 41 dynes/cm.

Ethomeen C/25 is already in use in a number of industries in this country. It is used in the production of metal cleaning solutions and also as a secondary flotation agent and as a chemical intermediate.

GRINDING BALL SIZE SELECTION

In 1952, Bond presented a valuable paper at the I.M.M. Symposium on Mineral Dressing, dealing with the "Mathematics of Crushing and Grinding", which included an empirical expression for calculating the correct make-up ball size for a mill. This formula has been found to be reasonably successful in practice, but the author has now made a critical examination of it, considering the theoretical influence of each of the governing factors, and has found that there are some divergencies.

In the light of these differences, he has produced a new formula which gives similar results and is theoretically sound. To complete the picture, information is also given in *Mining Engineering*, Vol. 10, No. 5, as to the "Start-up" grinding media charge and the amount of make-up required related to power draft.

NEW U.S. LUBRICANT

Molybdenum disulphide, a chemical compound long marketed as a hardener for steel and other metallurgical uses, is finding important new applications in the consumer field, according to reports from the United States. The first conception followed the upgrading of the raw material when it was discovered that purified molybdenum disulphide performed as a highly effective lubricant.

The compound, according to *The Journal of Commerce*, is being introduced as a filler for plastic and other materials. Use of the compound in lubricants for pipe joints, it adds, is expected to save thousands of dollars and valuable time in United States' oil field operations alone.

Machinery and Equipment

Flying for Mining

The D. H. C-4 Caribou, a twin engine passenger-cargo utility plane, recently joined the De Havilland of Canada group of special purpose aeroplanes designed to serve the Canadian north.

Unique in its ability to take off and land in a distance of less than 500 ft., the Caribou's payload ranges between 7,383 lb. on a 200-mile flight and 5,368 lb. on an 800 mile flight. The basic weight of the plane is 14,812 lb. and gross weight is 24,000 lb. This compares with a DC-3.

The short take-off and landing characteristics will enable the aircraft to operate in and out of tiny airfields, in bush and jungle landing strips, and from beachheads and short fields situated close to centres of population.

By no means the least important of the Caribou's possible applications is in the mining industry. Here it is confidently expected that the aircraft will provide valuable service in supplying mining camps, prospecting and development sites in difficult terrain.

PORTABLE SAFETY LAMPS FOR MINING

A private exhibition of Nife portable safety lamps held at the Queen's Hotel, Manchester, from October 13-16, showed the present-day range of portable industrial lamps produced by Nife Batteries. These hand, head and portable lamps are powered by Nife Nickel Cadmium Steel-Alkaline batteries.

The cells are made throughout of steel, both container and plates, and have active materials and an electrolyte that are completely stable. The lamps are claimed to have found widespread applications in industry, particularly in mining.

The lamps range from an all-purpose inspection lamp to a most powerful handlamp which supplies a beam of light equivalent to that of a motor car headlamp, and include the Nife Hydrogen Caplamp, a development of the modern caplamp used in coal mines. This is certified for use in atmospheres of the hydrogen and pentane groups, including petroleum.

A WHEEL WASHER

Designed to ensure a completely effective wash which prevents contamination of roadways by vehicles leaving off highway areas, the wheel washer produced by William Moseley (Engineers) Ltd., is essentially simple, yet effective in operation.

The washer consists of a heavy duty steel grid spaced on either side of two free running rollers which may be locked in position by means of a hand brake. A Ransomes and Rapier pump supplies water through a pipe and a series of nozzles, the water flow being controlled by a valve connected to the roller brake.

In operation, vehicles are driven on to the grid and the rear wheels are allowed to come to rest between the two rollers. The roller brake is then released with the rollers free, top gear is engaged and the rear wheels rotated at speed. The mud, clay and stones are washed from the underside of the lorry and fall through the grid to a sump which is periodically cleaned out.

It would appear that the wheel washer has marked application in quarries and at opencast sites, where continuous transportation passes from work area to highway.

A Series 2 longwheel base diesel Land-Rover on the washing grid

MINING MISCELLANY

Representatives of the Czechoslovakian government are due to arrive in Brazil to discuss a trade agreement between the two countries. Among the Brazilian products of interest to Czechoslovakia are iron ore fines from the Itabira mines, of which Companhia Vale do Rio Doce has accumulated large stocks. Czechoslovakia and Poland are expected to take 500,000 tons.

★

A new undertaking, Dolomite Industries, has been started at Batu Caves, in Selangor, for the purpose of reviving the Malayan marble industry. Malaya has huge resources of first-class limestone, which makes good marble. Pink, white, streaked, and other types of marble to rival any imported, can be produced in Malaya for local use and export. At Batu Caves alone, at least 2,000,000 tons is available.

★

A piezo-quartz crystal, the largest of its kind ever known, has been found in Kazakhstan, U.S.S.R. It is as high as a two-storey building and weighs 70 tons. The crystal hitherto regarded as the biggest weighed about 40 tons and was found in Brazil.

★

Two German geologists have been making a survey in the southern provinces of Ecuador, at the expense of the German government. Two American firms have also been given a contract for the exploitation and export to the United States of extensive titanium deposits on the coast.

★

Surveys of pyrochlore-bearing limestones in the Feira area of Northern Rhodesia suggest that one deposit may prove to be the largest in Africa, if not in the world. Other mineral occurrences in the area are monazite, thorium, and apatite.

★

The Brazilian Commercial Office in New York calls attention to the decline in America's imports of Brazilian mica. Shipments dropped from $U.S.2,728,017 in 1955 to $U.S.2,621,606 last year, although aggregate imports increased from $U.S.130,474,083 to $U.S.157,348,740. India is now the biggest supplier.

★

The second blast furnace in the U.S.S.R., and in the world, to be cooled by hot water has been put into operation at the Yenakiyevo Iron and Steel Mills in the Donets coal basin. It is fitted with an evaporating cooling system.

★

A "billion tons" of mineral ore, mostly iron and nickel, have been discovered in the southern Philippine island of Mindanao.

★

Production of crude magnesite in the first half of the current year in Austria amounted to 626,816 tonnes against 553,660 tonnes in the comparable period a year earlier. Sintered magnesite output reached 225,933 tons against 196,322 tons, caustic calcined magnesite 46,624 tons against 50,317 tons, and magnesite bricks and slabs 125,978 tons against 11,863 tons.

★

In its annual report on the subject of Netherlands New Guinea, submitted to the United Nations under article 73c of the Charter, the Dutch Government stated among other things that there had been no important capital investments during the year under review other than those made by the Netherlands New Guinea Petroleum Co., but that possibilities exist for the exploitation of cobalt ore and nickel.

★

Danish American Prospecting is drilling for oil near Lögumskloster in Jutland, Denmark, and a borehole has now been drilled to a depth of about 7,000 ft. The successful drilling at Kappel on the German side of the border between Denmark and Germany has added increased interest to the search for oil in Denmark which now has been going on for 20 years. Gulf Oil has previously spent about £3,500,000 and Standard Oil of New Jersey (Danish American Prospecting) has spent £500,000.

★

The smelting plant, A/S Björlvefossen at Alvik, West Norway, will soon be starting three new ferrochrome ovens. These ovens will increase the plant's producing capacity 50 per cent to 15,000 tons per year, making A/S Björlvefossen Norway's largest producer of ferrochrome.

★

A £300,000 oil survey of the Irish Republic will be started in the next few weeks by Mr. J. Millar, an American geologist, at the request of the Irish Minister for Industry and Commerce, and two interested American oil companies, Messman-Rinehart Oil Co., of Wichita, and the Ambassador Oil Co., of Fort Worth, Texas. These two companies are at present negotiating with the Irish government for oil concessions covering the whole of the Irish Republic's 27,137 sq. miles.

★

Norwegian export of ferrochrome in the first half of 1958 amounted to 8,400 tons against 12,200 tons in the same period last year.

★

An association of Sao Paulo, Brazil, steel manufacturers has organized a company to produce 100,000 tons of sponge iron at the outset, in order to relieve the shortage of scrap iron. The home market is at present short of iron, steel, and all building materials, owing to the big demand for construction works at Brasilia, the new federal capital.

★

A total of 4,800 tons of coal from Svalbard (Spitzbergen), Norway, has successfully been coked in Germany and 2,000 tons of this coke are going to be tried at The Norwegian State Iron Works at Mo i Rana. A Norwegian electrical coking method for Svalbard coal is also to be tried.

★

In 1959, Colombia will produce 10,000 tons of uranium in an untreated state. Permission has been requested for the installation of a plant for the treatment of uranium with a capacity of 30 tons per day. This plant will be installed in the Department of Santander by a Colombian company.

★

Rana Iron Works, Mo i Rana, Norway, is starting production on a small scale this month. Some 50,000 tons of raw ore per year will be treated in the pilot ore-dressing plant. The quantity of low-grade iron ore in the district is supposed to be more than 100,000,000 tons.

★

Development work has been started at the Conjecture silver mine in Northern Idaho, United States, by two companies, Conjecture Mines, of Spokane, and Federal Uranium Corp., of Salt Lake City.

★

Prospecting for coal by drilling carried out by the Geological Survey of India in Ondal in West Bengal and the Garro Hills in Assam, during the last field season, has resulted in proving further reserves. The proved reserves, on the basis of 200 m. radius around a borehole drilled to a depth of 2,956 ft. in Ondal, were about 5,500,000 tons, whereas the results calculated on the same basis in Garro Hills were about 300,000 tons.

★

The Norwegian firm Elektrokemisk A/S is to deliver two more electrical pig iron furnaces in addition to the seven furnaces previously ordered by the Iron and Steel Works which is under erection in Venezuela for smelting the iron ore from Cerra Bolivar.

★

The Belgian Government has decided to close down a further six pits in the Centre, Charleroi and Liege areas, making nine "infra-marginal" pits which have now been closed. These mines produced 1,050,000 tons of coal in 1957, and employed about 9,000 men.

★

A contract has been signed in Oslo for the supply of about 4,000,000 tonnes of alumina, much of which would come from Jamaica, to Norway for processing in return for the supply of aluminium from Norway to Canada. Alumina Jamaica Ltd., a company which processes bauxite mined in Jamaica into alumina, have decided to slow up the completion of their second factory. The deferment is related to the decision of the parent company, Aluminium Ltd., to retain its smelter capacity at the level of 770,000 tons of metal, if not to reduce it, instead of expanding it as had at one time been planned, to produce 1,000,000 tons annually. Another aspect of the easing in demand for alumina has been the slight falling off in production by one of the two American companies mining bauxite for shipment to the U.S.A. for processing.

★

A new diamond-cutting plant, costing $20,000, and known at the Correira and Van Deutekon Diamond Factory, has been opened in British Guiana. It will convert raw diamonds into the finished commercial product.

★

A new company, Messrs. Caribbean Iron Mines Ltd., Port of Spain, which was registered early in September in Trinidad, capitalized at $250,300. It has been formed to develop deposits discovered by a gold and diamond prospector from British Guiana. Estimates place the wealth of the deposits at over 20,000,000 tons, and the vein is stated to be a continuation of one originating in

the Amazon Valley and running through French Guiana, over the Venezuela-British Guiana border, under the Gulf of Paria, and into the Northern Range of Trinidad and into Tobago.

★

Japan is to start oil prospecting in North Sumatra and two firms at present working on separate plans for Sumatra oil development have been advised to combine their efforts.

★

Prospecting at Northern Canada Mines has revealed two new finds, one of gold-silver and the other tungsten. The locale is to be kept secret until Dr. N. S. Beaton, the company's consulting geologist, has examined and reported on the discoveries.

★

The Government of Pakistan is to make tax concessions to those engaging in the exploration and extraction of minerals, except for natural gas and oil for which tax concessions are already in force.

★

With the entry into action of an electric furnace attached to the iron mines of Minas de Vila Cova, Campea, Marao, Portugal, production of pig iron in Portugal has commenced. The furnace was installed under the auspices of the Six Year Development Plan.

★

A promising new ore find has been discovered at Elder Mines, Quebec, Canada. A drive on the seventh level, or 950-ft. horizon in virgin ground, in the eastern section of the mine, has opened 223 ft. of continuous ore, running 0.192 oz. gold cut grade across a drift width of 6.0 ft.

★

St. Lawrence River Mines, Canada, is embarking on a major scheme of expansion, which includes the opening of an exploration department and the acquisition of control of four companies. In addition to its own holdings in the Oka area of Quebec, St. Lawrence Mines has now the working control of the following companies: Oka Uranium and Metals, Lake St. Joseph Iron, Lake Superior Iron, and Antiquois Mining Corp.

★

Tin production in Japan during the first half of 1958 dropped in comparison with the corresponding figures last year, being 11,164 l.tons against 12,069 l.tons.

★

Copper has been discovered on the property of Sandy River Gold Mining Co., in the Toad River area of northern British Columbia, Canada. The showings have been traced for a distance of about 650 ft. and show widths from 4.0-5.0 ft.

★

The Aluminium Co. of Canada is to provide the foreign capital for a new Spanish company, called "Aluminio de Vigo S.A.", which will produce 25,000 tons of aluminium per anum in a new plant in the Vigo Free Zone.

★

The Santoru Societa Mineraria Per Azioni, a subsidiary of Sitamet S.r.l., of Milan, has just completed at Santoru on the eastern coast of the Island of Sardinia, a completely mechanized installation for the loading of barite ore produced by the Santoru mines. The installation consists of a belt conveyor system including a silo for the storage of the ore, permitting the loading at the rate of 125 tons per hour of 500/900 ton vessels. The draught is 12/15 ft. The ore for the time being is shipped in bulk to the port of S. Antioco, for transhipment into ocean vesels, having a capacity of 5,500/6,500 tons. This ore is used for oil drilling purposes. Mining operations started late in 1957, and it is estimated, by the end of 1959, that a monthly production of 2,000 tons commercial ore will be reached, minimum 93 per cent $BaSO_4$, and minimum 4.25 specific weight. The ore reserves in the Santoru area, one of the most important barite deposits in Sardinia and perhaps in Italy, have been assessed so far at figures varying between 500,000 and 1,000,000 tons.

★

Reliable sources report that an important iron, copper and gold discovery was recently made in the interior of Antofagasta Province of Chile, in a region close to the Argentine frontier. The discovery was registered with the authorities at Calama by a miner, and covered an area of 1,800 hectares. Two geologists from the Bethlehem Steel Co. and the Compania Minera Santa Fe are in Antofagasta to ascertain the importance of the discovery.

★

New Consolidated Gold Fields (Australasia) Pty. Ltd., in association with other overseas interests has taken an option over two sq. miles of country about five miles from Broken Hill. They will investigate silver-lead-zinc prospects. It is understood that two overseas companies with which the Australian company is associated in the new venture, are Canadian.

★

The government-sponsored Bureau Recherches Geologique, Geophysiques et Minières de la France Metropolitain this week was allocated by the Ministry of Industry and Commerce a 6,260 hectare permit for exploration of molybdenum, tungsten, lead, zinc and copper ores in eastern France in the Vosges Mountains.

PERSONAL

Mr. P. D. Osborn, B.Sc. (Eng.), A.M.I.E.E., is to assume complete responsibility for the sale of motors produced at the Guiseley factory of Crompton Parkinson Ltd. Mr. C. J. Teasdel has been appointed Product Sales Manager, Chelmsford Machines.

★

Mr. R. T. P. Bell, Sales Manager of Joy-Sullivan Ltd., mining machinery and quarrying equipment manufacturers of Greenock, Scotland, has died after a long illness. He was 57. Mr. Bell joined the Sullivan Machinery Co. in 1931, then when the company merged with the Joy Manufacturing Co. after the war, Mr. Bell was appointed Home Sales Manager in 1953.

★

Sir Charles Hambro, K.B.E., M.C., has been elected chairman of Union Corporation in succession to the late Viscount Bracken. Mr. T. P. Stratten has been elected deputy chairman and retains the appointment of managing director.

COMPANY EVENTS

International Harvester Co. of Australia Pty. Ltd., recently announced the purchase of Fowler Engineering Pty. Ltd., a division of Fowler Construction Ltd. The new plant will be used to manufacture International Harvester's line of construction and earthmoving equipment in Australia.

★

As from October 27, 1958, the main office of Protolite Ltd., will be transferred to the premises of the parent company, Murex Ltd., at Rainham, Essex. The new telephone number is Rainham, Essex 3322 and the cable address, Protolite, Rainham-Dagenham Telex.

CONFERENCES AND EXHIBITIONS

Sir Harold Howitt, G.B.E., D.S.O., M.C., F.C.A., J.P., a member of the Cohen Committee, will open the British Institute of Management's National Conference, "The Challenge of Change", which is being held in Brighton from November 26 to November 28.

★

The Second General Meeting of the Cornish Institute of Engineers is to be held at the Camborne School of Mines on October 24. A lecture entitled, "Some Current Developments in the Steel Industry" will be given by Mr. C. W. J. Crawford, A.I.M.

★

At the 100th Annual General Meeting of the South Wales Institute of Engineers held on October 16, the presidential address was given by Mr. E. Jones, M.I.Mech.E., M.I.E.E.

★

The Gauge and Tool Makers' Association are to hold their trade luncheon at the Savoy Hotel, London, on October 22. The annual general meeting of the Association will be held at the Savoy Hotel on November 27.

CONTRACTS AND TENDERS

India

Two Universal Excavators, powered by 4-stroke diesel engines of about 100 h.p., with one dragline attachment, two clamshell attachments for excavating sand, and one clamshell attachment for excavating clay. Also, one Universal Excavator powered by 4-stroke diesel engine of about 160 h.p., with one clamshell attachment for excavating sand, and one clamshell attachment for excavating clay. Attachments for the basic units and spare parts as specified. Issuing authority and address to which bids should be sent, Chief Engineer, Madras Port Trust, Madras. Closing date, October 30, 1958. Ref. E.S.B. 24446/58. Telephone inquiries to Chancery 4411, extension 738 or 771.

Vietnam

One Scraper, capacity struck 13 cu. yds., heaped 18 cu. yds., gross weight 39,000 lb., accessories and spares. Three Scrapers, capacity struck, 10 cu. yds., heaped 14 cu. yds., gross weight 37,000 lb., accessories and spares. Two Tractors, wheeled, heavy-duty, gross weight 24,000 lb., equipped with attachments, cable winch and controls, accessories and spares. Six Crushers, jaw, gross weight 8,500 lb., 30 h.p., diesel engine, size of Crusher 10 x 16 in. feed opening dimensions, accessories and spares. Six Compressors, air, diesel engine driven, capacity 600 cu. ft. minute, gross weight 9,500 lb., accessories and spares. Bids to Central Purchasing Authority, P.O. Box 131, Saigon, Vietnam. Closing date, October 29, 1958. Ref. E.S.B. 24152/58/I.C.A. Telephone inquiries to Chancery 4411, extension 354.

Metals and Minerals

The Joker in the Pack

The debate on precisely what Russia is up to in her metal marketing policy continues. The latest contribution comes from the U.S. Bureau of Mines in a report on Russia's mineral trade prepared by members of the Bureau's Division of Foreign Activities. We hope to revert to this considerable document in a later issue; meanwhile, one or two conclusions in the report have a direct bearing on our comments in this column last week.

The authors of the report are of the opinion that the primary cause of the emergence of growing Russian metal exports has been the success which has accompanied their major exploration efforts of recent years and the "crash" production programme initiated to complete stockpiling requirements. Some measure of the emphasis placed on these programmes is shown by the U.S. Bureau's estimate that the U.S.S.R. is spending about 1 per cent of its gross national product on minerals exploration alone.

It is obviously easy enough for a programme of this magnitude to exceed planners' estimates by considerably more than the comparatively small tonnages being exported to the West. Moreover, even if expansion in minerals output had been precisely according to plan, it by no means follows that progress in various branches of the industrial development programme would have necessarily resulted in the demand on which the mineral planners were calculating.

The report goes on to stress that the U.S.S.R. needs foreign exchange for its industrial imports, if necessary, to the extent of denying some of its own domestic metal requirements. This confirms, at any rate inferentially, the view expressed here last week that Russian gold stocks and production are already being fully utilized.

The report is, perhaps, on more debatable ground in suggesting that Russia has an interest in depressing world prices on the grounds that these can affect the price which the Soviet Union must pay for the same commodities. It may well be, as the report suggests, that Russia exports many commodities of which she is also herself a substantial importer from other Communist countries, but this can only be for one of two reasons. Either the logistics of mineral shipments in so vast an area make such operations profitable, or else the U.S.S.R. is, in effect, acting as the central disposal organization for Communist *bloc* surplus commodities. In the former case it could, other things being equal, be in Russia's interest to depress world prices but in the latter case the object must surely be to maximize earnings from relatively small tonnage exports to facilitate the import of manufactured products into the *bloc*.

The report also rightly points out that while many of the Soviet exports constitute only a small proportion of Free World consumption, these small tonnages are quite sufficient to dislocate established trade patterns and markets. It is, however, not clear from the abridged summary of the report, which has so far reached us, whether the authors go on to stress the point that the reason for the dislocation comes from the uncertainty as to just when and in what quantities metal is going to be offered.

Until recent years East-West trade in minerals was so slight that Free World statistics, where obtainable soon enough, could provide an adequate basis for calculating market trends. We are now confronted with a situation where Russia is entering world markets while keeping her own mineral statistics under wraps. *Mining Journal* readers will be familiar enough with our views on the urgency of producing prompt and reliable world metal statistics, but the magnitude of this task is, of course, much increased if the Communist *bloc* supply/demand picture has to be assessed as well.

In this connection the International Tin Council's recent exchanges with Russia are illustrative of the difficulties to be expected. So long as Russia must be regarded as an unpredictable exporter of tin for anything up to perhaps 15 per cent of Free World consumption, the value of the I.T.C.'s tin statistics, hitherto a shining example to other sections of the mining industry, must be sadly undermined.

LONDON METAL AND ORE PRICES, OCT. 16, 1958

METAL PRICES

Aluminium, 99.5%, £180 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £190 per ton
Crude (70%) £190 per ton
Ore (60%) bases 19s. 6d./20s. 6d. nom. per unit, c.i.f.

Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 9s. 6d. lb.
Cerium (99%) net, £16 0s. lb. delivered U.K.
Chromium. Cr. 99% 6s. 11d. lb.
Cobalt, 16s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram.
Gold, 250s. 0¾d.
Iridium, £20/£22 oz. nom.
Lanthanum (98/99%) 15s. per gram.
Manganese Metal (96% - 98%) £290
Magnesium, 2s. 5¼d. lb.
Nickel, 99.5% (home trade) £600 per ton
Osmium, £17/£18 oz. nom.
Osmiridium, nom.
Palladium, £5/£5 15s.
Platinum U.K. and Empire Refined £21 5s. oz.
Imported £18 15s./£19 15s.
Quicksilver, £78 0s. ex-warehouse
Rhodium, £40/42 oz.
Ruthenium, £14/£16 oz. nom.
Selenium, 50s. 0d. per lb.
Silver, 78¼d. f. oz. spot and 78¾d. f'd.
Tellurium, 15s./16s. lb.

ORES AND OXIDES

Bismuth		30% 5s. 0d. lb. c.i.f. 20% 3s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable) 48%	(Ratio 3:1)	£15 15s. 0d. per ton c.i.f.
" Hard Lumpy 45%	(Ratio 3:1)	£15 10s. 0d. per ton c.i.f.
" Refractory 40%		£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3:1)	£14 0s. 0d. per ton cli.f.
Baluchistan 48%	(Ratio 3:1)	£11 15s. 0d. per ton f.o.b.
Columbite, 65% combined oxides, high grade		nom.
Fluorspar—		
Acid Grade, Flotated Material		£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)		156s. 0d. ex works
Lithium Ore—		
Petalite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		40s. 0d./45s. 0d. per unit f.o.b. Beira
Ambigonite basis 7% Li_2O		£25 0s. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46% - 48%) basis 55s. 0d. freight		83d./85d. per unit c.i.f. nom.
Manganese Ore (43% - 45%)		70d./75d. per unit c.i.f. nom.
Manganese Ore (38% - 40%)		50d./54d. per unit c.i.f. nom.
Molybdenite (85%) basis		8s. 5d. per lb. (f.o.b.)
Titanium Ore—		
Rutile 95/97% TiO_2 (prompt delivery)		£35/£36 per ton c.i.f. Aust'n.
Ilmenite 52/54% TiO_2		£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)		60s. 0d./65s. 0d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		8s./8s. 11d. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) (65 - 66% ZrO_2)		£14 0s. per ton c.i.f.

ALUMINIUM AIMS AT BIG TONNAGE USES

World production of aluminium by volume is today no more than about 3 per cent of the world production of steel and it has often been said that the iron and steel industry will not be unduly concerned at the threat of aluminium competition until this percentage has been doubled or trebled. Nevertheless, the writing is on the wall, and there is no doubt that, so far as the aluminium producer is concerned, it is the big tonnage markets on which he has his eye.

Indicative of this is a statement made by Dr. Robert Thompson, of General Motors Research Laboratories, that the advent of the aluminium automobile engine block "can't be far off". In addressing a meeting of foundry men this week, Dr. Thompson virtually served notice on them to develop new products to replace this probable loss of business. He said that the trend towards lighter weight and smaller cars, in which the user would still require maximum room and performance, were forcing engineers to attempt to hasten this process. His corporation's engineering staff had, he said, tested aluminium engines showing very good results with a weight saving of up to 200 lb. As he pointed out, such trends have a snowballing effect because the lighter engine requires less structure to support it and better weight distribution. Costwise, the aluminium engine block is now competitive with cast iron, so it presumably only remains for the technological bugs to be eliminated.

While this kind of news must obviously have the steel men looking over their shoulders it is no idle speculation to wonder how soon the aluminium producers may be similarly placed. It is all of two years ago now since one of the

German car manufacturers anonunced that on one of their models over 35 per cent of all castings used were of magnesium.

*

Further to last week's report that Reynolds Metals was resuming full production at Troutdale, comes a report that this company plans to increase aluminium production at its San Patricio Plant, Texas, by 1,000 s.tons a month within the next four weeks. This increase, which is stated to reflect the recent improvement in market conditions, brings production at this plant up to about 90 per cent of capacity. Kaiser Aluminium is also starting up another potline at Mead, Washington, which will add about 1,800 s.tons of aluminium a month. Kaiser will then be producing at an annual rate of 474,000 s.tons against a capacity of 537,000 s.tons.

*

Further to our note here last week on the outlook for aluminium production in French Guinea—now independent—the French Overseas Minister has stated that France intends to go ahead with her bauxite investment plans there.

SILVER PRICE BOOST

The New York silver price has continued its upward trend of recent weeks with London following. On Wednesday Handy and Harman was quoting 90¾ c. per f.oz. compared with the level of 88⅛ c. at which, until the past two or three weeks, it had stood for some eight months. The London quotation has been similarly affected with the spot price up to 78¾d. and forward at 78⅞d. Since the beginning of last week the London price has now risen by over 2d., and is at its highest for nearly a year.

COPPER · TIN · LEAD · ZINC

(From Our London Metal Exchange Correspondent)

It has been a particularly interesting week on the market, and after the period of price consolidation which was discernible last week, further useful advances have taken place. Trading has been active, featured by a widening in the backwardation on copper, whilst in the case of lead a contango has re-appeared.

STRIKES WILL TRIM STOCKS—

A growing realization on the part of consumers that the prolonged strike in Rhodesia alone will result in a substantial loss of metal to the market is a prominent feature behind the present trend. Talks are continuing towards a settlement but it seems clear that there will not be an early return to work and already it is estimated that after having closed for a month the loss of copper is in the region of 37,500 tons.

In addition, International Nickel have been strike-bound since the last week of September as a result of the company and the union failing to agree on a new wage contract, and in this case the estimated loss will be 8,300 tons a month. One of Kennecott's properties has also been closed for nearly two weeks as a result of an internal dispute and here the output has been running at 5,500 tons a month. At a total rate of 51,300 tons a month this represents an appreciable percentage of the Free World's output of copper. A new factor in this sphere is a strike by railway workers in Chile, which will affect the movement of metal to the ports to the extent of about 5,000 tons a week.

—AND ARE HOISTING PRICES

The backwardation on the London market was already showing signs of widening and the squeeze in nearby copper which developed at the end of last week, resulting in a backwardation of some £15 per ton, was more due to technical considerations affecting the market rather than to any other reason. This has shown once again that the stocks in U.K. official warehouses, amounting to 9,600 tons, are not generally available to the market, being held in firm hands. This week more metal for early delivery has been on offer with a consequent and welcome narrowing in the rate.

Copper has also been firm and active in the U.S., and following a further ½ c. rise in the customs smelter price to 27½ c., Phelps Dodge initiated a rise of 1 c. effective October 13, thereby bringing their price in line with the customs smelter's. Following this, customs copper again moved up 1 c. and is currently quoted 28½ c. Apart from a good demand, the fabricating companies were pressing for a higher price for electro, so that they could boost the price of their products. This upward movement was promptly followed by Kennecott and Anaconda with effect from October 14. This is the second increase in the producer price since the low level of 25 c. earlier in the year. International Nickel Co. of Canada have also raised their price recently by ½ c. to 26½ c. and the Belgian price has also advanced to Frs.B31.75 per kilo against 31.25 previously.

European demand has been well maintained and became brisk in the middle of the week. It has been reported that negotiations have been completed for the sale to the Soviet Union of 32,000 tonnes of Chilean copper, mainly in the form of sheet and wire.

TIN FIRMER

There has been little change in the tin market, and with outside demand routine, business has been on the quiet side. It is satisfactory to note that the recent heavy offerings of metal in the East at the beginning of the new quota period have been well absorbed. London turned firmer in the middle of the week following a rise in Singapore and the general belief is that an upturn in prices might well take place when the quota of sales for the current period is completed. There have been no further developments as regards the future course of action of the buffer stock in the tin market, and it is a matter of conjecture as to what the next move will be.

Malayan exports in September amounted to 2,777 tons compared with August's figure of 4,002 tons. Total shipments for the first nine months of this year were 36,282 tons against 53,978 for the same period in 1957.

On Thursday morning the Eastern price was equivalent to £753 per ton c.i.f. Europe.

CONFUSION OVER LEAD-ZINC QUOTAS

The sharp rise in lead and zinc has perhaps been the most prominent and interesting feature of the London market, and in New York the lead price has moved up ½ c. to 13 c. and a further rise in zinc is expected shortly. Last week we referred to extensive buying of metal for early delivery, presumably for shipment, and this appears to have been continuing although perhaps to a lesser extent. It is impossible to say at this stage whether, if indeed this metal is to be shipped to the U.S., it will be possible to obtain the necessary customs clearance. It would seem that shippers are prepared, if necessary, to risk the necessity of having to place it in bonded warehouses on the other side.

The U.S. import quota figures were announced during the week and show that in the case of lead metal the quota for all other foreign countries other than Mexico, Australia, Canada, Yugoslavia, and Peru, will amount to only 3,040 tons for the quarter beginning October 1. In the case of zinc metal, the tonnage is the same for countries other than Canada, Belgium, Mexico, Belgian Congo, Peru, and Italy.

The Mexicans have announced an immediate resumption of lead and zinc exports on a provisional basis but a limit of 5,000 tons has been placed on each exporter pending the definite setting up of quotas on an individual basis. From Washington originate reports that the decision on the part of the U.S. authorities to impose quotas raises a legal question, and the right of the authorities in acting as they did has been challenged by the Federal Customs Court in New York. Some sources in the U.S. suggest that barter trading in these metals might be renewed in place of the quota system in order to provide alternative support.

The U.S. zinc figures for September showed an increase in total shipments from August's figure of 69,309 tons to 77,118 tons, whilst stocks showed a decrease to 238,116 tons against August's 251,529 tons.

Closing prices are as follows:

	Oct. 9		Oct. 16	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£227	£228	£241½	£242½
Three months ..	£222½	£223	£234	£234½
Settlement ..	£228		£242½	
Week's turnover	11,075 tons		12,850 tons	
LEAD				
Current ½ month	£71	£71⅛	£76⅛	£77
Three months ..	£72⅛	£72⅜	£77⅛	£77⅜
Week's turnover	7,150 tons		10,250 tons	
TIN				
Cash	£738	£739	£744	£745
Three months ..	£732	£733	£735	£736
Settlement	£739		£745	
Week's turnover	605 tons		620 tons	
ZINC				
Current ½ month	£67½	£67½	£72½	£72½
Three months ..	£66½	£67	£71½	£71½
Week's turnover	7,650 tons		9,975 tons	

London Metal and Ore Prices appear on page 423.

Mining Finance

Too Far, Too Fast in Coppers?

A feature of mining markets over the past few weeks has been the persistent strength of Rhodesian copper shares. On Tuesday this week all Copperbelt issues were standing — and being bought — at prices equal to or near the highest point of the year, levels which were up to 60 per cent above the year's lows. Obviously, there had to be a recovery, and a strong one, from the depths reached early this year. The question, nevertheless, remains whether this recovery has not been overdone.

Like most base-metal shares, copper equities take their cue from the trend of the metal price. This is a perfectly reasonable basis, but only as long as the fluctuations, actual or prognosticated, taken into account are long-term, based on the prospective demand/supply position. Often, however, fluctuations are caused not by any real change in the metal's statistical position, but by what would be called "technical factors" in the share markets. In particular, the present strength of the metal rests largely upon a growing shortage of copper in Europe as a result of the E.M.U. strike in N. Rhodesia. The possible effects of this and the likely reactions of American producers who alone hold substantial stocks, are discussed on page 412. In any event, it is apparent that the present three months' price of £230 has no direct relationship with the earnings of the Copperbelt mines. Whether the strike is prolonged or not, the resumption of supplies from Rhodesia will eventually restore the balance between supply and demand, with a corresponding lessening of the present upward pressure.

It is of prime importance to know just what sort of earnings are being discounted by copper shares at the present time. Taking Nchanga as being reasonably representative, this producer was quoted on Tuesday at a middle price of 12¼. Much depends on the yield, which investors require from a copper share under normal circumstances, and, unfortunately, there are no periods in recent times when prices were not discounting either a rise or fall in earnings, so that any estimate must largely be based on guesswork. However, taking a line through the rough relationship between copper share yields and the general level of markets, 8 per cent would seem to be about right for Nchanga. This at today's price gives an expected dividend in due course of about £1, the exact figure depending on the estimate made of the length of time still to elapse before such a dividend level is actually regained.

The last time Nchanga paid £1 was in 1956-7, and the average price it received for its product during that year was somewhat above £280.

It is true that the situations are in some respects not entirely comparable. Nevertheless, it would appear that on a conservative estimate the present market quotation for Nchanga anticipates a copper price averaging somewhere around £270 per ton.

That this is demonstrably unreal in the foreseeable future has already been shown. Quite apart from this, however, it should be remembered that both Sir Ronald Prain and Mr. Harry Oppenheimer have mentioned £240 per ton as being about "right" for both producer and consumer. It is high enough to ensure profitable operations for most producers, thus assuring consumers of regular supplies, and low enough to cause no worries about losing marginal markets to competitor metals, thus assuring producers of a regular market.

In other words, it looks as if copper shares are already too high for comfort. Whether a break will ensue could easily depend upon how the Americans react to rising L.M.E. prices. It may well be that the best bargain in this section of the share market is a "put" option on, say, R.S.T. at 1s. 9d.

LONDON MARKET HIGHLIGHTS

A firm, if not particularly exciting, start to the week was provided by the South African gold share market. A steady stream of modest buying orders reached London from the Cape, most of them for Free State Geduld and to a lesser extent Free State Saaiplaas.

Against this background, the first of the September quarterly reports—those of the Anglo American group—made their appearance to the gratification of all concerned. The reports were generally excellent and in the case of Free State Geduld, exceptional. News of development values of over 2,000 in.-dwt. in that mine's No. 2 shaft area signalled a rise of several shillings to 102s. 9d. in the shares. The rest of the O.F.S. market quickly followed the trend. Anglo American, themselves, which had recently lost a great deal of ground on nothing more than a spate of small selling orders from the Continent, soon recovered to 157s. 6d. Also good were Blinkpoort (55s.) in recognition of their large holding of F.S.G.

Other good gains were stimulated by a scarcity of stock, notably in Welkom (19s.) and Gold Fields (56s. 3d.). Once more, the unexplained buying of "Freddies" (6s. 3d.) intrigued market observers, particularly when Johannesburg Consolidated advanced to 49s.; this seemed to suggest that whatever was behind the original buying of "Freddies" the other week, probably also concerned "Johnnies". Having got this far, market observers wondered if the two companies might be contemplating some decision about the payable prospect to the south of Randfontein.

While Kaffirs were making up their minds whether to move ahead or not, Copper shares advanced solidly. The strength of Wall Street, coupled with the advance in the commodity price, were sufficient to bring in buyers of any share with a copper interest. But it was the shares of those mines unaffected by Copperbelt labour troubles that showed the most outstanding movements. Among these, Messina shares rose 10s. to 107s. 6d. and the options were 8s. up to 65s. M.T.D. Mangula advanced to a peak of 8s. 9d. in a record turnover. "Tanks" rose to 65s.

Tin shares for the most part seemed content to stay still and let the metal price find its own level. Lead-zincs adopted the same policy for a while, but when an almost incredible rise occurred in the metal prices, share values quickly made up lost ground. Consolidated Zinc (55s.), New Broken Hill (39s.) and Broken Hill South (47s. 3d.) all responded sharply to the movement.

At the same time it was difficult to see that the rise in lead and zinc prices was sufficient justification for the corresponding increase in share values. The rise in the metals has stemmed largely from the impact on U.S. domestic consumers on the recently imposed lead-zinc import quotas there. U.S. prices have thus risen and London has followed as dealers here have seized the chance of taking advantage of the better U.S. prices before the quotas are filled. Once these quotas are filled, lead and zinc here will become much more dependent on non-U.S. consumer demand. On the recent showing, this demand seems unlikely to be sufficient to justify current prices of lead and zinc on the London Metal Exchange.

TRONOH TAKES THE LONG VIEW

Like Southern Kinta, discussed here last week, Tronoh Mines is a large multi-dredge concern, strong financially—net quick assets at December 31, 1957, were around £1,500,000—and with sufficient flexibility to be able to employ its human and material resources to the best advantage during the present period of restriction. Additionally, the purchase of the Puket dredge leases and quota has enabled Tin Lay, Tronoh's subsidiary in Thailand, to continue operating profitably, although its own quota was too small to be economic.

Also, like Southern Kinta, Tronoh is taking advantage of the unavoidable loss of output to carry out necessary capital work. In Tronoh's case this has been concentrated on the No. 1 dredge, which works an area of rather lower grade than those of the other three units, at a somewhat higher cost per yd. dredged. At the outset of tin restriction the dredge was shut down, and work began on its conversion from steam to electric operation. On completion of the work, trial runs were carried out, confirming that fuel costs had been considerably reduced, and the dredge was placed on care-and-maintenance. Tronoh's quota is being produced by the three Kampar section dredges, which, in a praiseworthy effort to avoid hardship to the company's labour force, are working five days per week.

In his circulated statement, Mr. J. H. Rich, the chairman, looked well beyond the end of tin restriction to the time, closer than many realize, when the Malayan mining industry's major problem will be not over-production but land shortage. The seriousness of the situation, pointed out Mr. Rich, is em-

phasized by the fact that at April 30 last, 14 dredges were closed down, not because of tin restriction, but because their reserves were worked out. Many other mines were rapidly running out of land. All the more encouraging, therefore, was the setting up by the Federation Government of a national land council to formulate a national policy for land utilization.

The Tronoh Malayan group itself is making attempts to expand known reserves through the operations of Tromal Prospecting, which is currently examining sea areas off the Thai coast. No payable area has yet been defined, although results to date are encouraging enough to justify further prospecting.

Another example of this group's forward-looking policy is the provision of scholarships for Malayans at the Camborne School of Mines. Three men are studying there at the moment, while another two are just starting. It is hoped that some of these students will enter the service of the Tronoh-Malayan group as qualified mining engineers in due course.

Extracts from Mr. Rich's circulated statement are on page 427. Readers will recall that the report of the Constitutional Commission on this question was fully discussed in *The Mining Journal* of July 11, 1958.

TATI'S COAL ACQUISITION

Further details have been released concerning last May's deal between Tati Goldfields and Trans-Rhodes Finance and Mining Co., which resulted in the Tati Co. taking an interest of 20 per cent in the issued capital of African Coal Investments (Pty.). Tati paid £15,000 for these shares, which was used by Trans-Rhodes in subscribing for 150,000 Tati shares at par. At the same time, Tati bought 150,000 Trans-Rhodes shares at 2s. in the open market.

African Coal has about 3,600 acres of coal rights in Native Reserve No. 12 in Zululand. Prospecting on one of these areas has confirmed the existence of high-quality anthracite over a seam width of 4 ft. 6 in. to 6 ft. On another area a similar coal horizon with a width of 5 ft. to 6 ft. 4 in. has been discovered, extending over a distance of approximately 2,100 ft.

A long-term agreement is being concluded with a large European importer under which he will undertake to purchase the whole of Tati's output available for export up to a maximum of 150,000 tons per annum. The terms, says the announcement, are most favourable to Tati. This seems to be borne out by the fact that the importer is to provide shipping facilities and finance for the transport of the coal purchased by him.

The main hurdle which Tati has yet to overcome is the common difficulty of all South African collieries—the shortage of rail truckage. As yet Tati has made no application for an allotment of trucks, and it is, therefore, impossible at present to put a date on the commencement of mining operations, or, indeed, to estimate the initial magnitude of the undertaking.

Another point which needs clarifying before the importance of the acquisition can be gauged, is the nationality of the importer. Should his business be in one of the E.C.S.C. countries, the question of import quotas may prove to be the most recalcitrant obstacle of all.

It is anticipated that Mr. E. M. Lloyd, the chairman, will be able to give fuller details at the annual meeting, which was held last year on November 19. In the meantime, it should be remembered that at the date of the last balance sheet (March 31, 1957), Tati was carrying forward a debit balance of over £37,000, while liquid assets, less liabilities and provisions, were only £23,000. Obviously, before any question of dividends arises, there must be a period during which the main objective will be the strengthening of Tati's finances.

NEW UNION PAYS AGAIN

The first dividend for twelve years—5 per cent—has been declared by New Union Goldfields from the proceeds of 1957-1958 operations. The profit for the year shows a sharp rise from £95,390 to £238,124. Additionally, £109,357 is brought in from investment appreciation compared with last year's provision of £172,785 against depreciation. After deducting £100,000 (the cost of the dividend) and £219,478 transferred to reserve, the carry forward is increased from £17,051 to £44,359.

Apex Rights Offer.—Apex Mines is to make a one-for-one rights offer to shareholders at par, subject to approval at an E.G.M. The capital is needed to exploit the No. 4 seam at the company's Greenside Colliery. In order to counteract fluctuating supplies of native labour, the new seam is to be equipped for an output of 30,000-35,000 tons monthly, using mechanized methods wherever possible. A further circular will be issued on December 12.

Kramat Pulai Offer Unconditional.—The offer by Malayan Tin for the shares of Kramat Pulai is now unconditional, acceptances having been received in respect of over 90 per cent.

British Guiana Strike.—Workers at British Guiana Consolidated Goldfields went on strike on October 11.

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CLUTHA RIVER GOLD DREDGING

The twenty-fourth annual general meeting of Clutha River Gold Dredging, Ltd., was held on October 15, in London.

Mr. F. Gordon Payne, M.I.Mech.E., Chairman, presided, and the following is an extract from his circulated Statement:—

The profit for the year ended March 31, 1958, before taxation amounts to £11,736. The net profit after charging £3,543 for taxation, amounts to £8,193 compared with £8,640 in the previous year. £1,000 has been written off Mining Land, Licences, and Prospecting Expenditure, and £2,000 has been transferred to General Reserve. As the dredge has been kept in a good state of repair and substantial amounts have been written off the plant in previous years, it has not been considered necessary to provide for further depreciation for the year under review. A dividend of 5 per cent is recommended, leaving a balance of £4,506 to be carried forward to the current year.

The average price received for our gold during the year was £12 8s. 8d. per fine ounce, compared with £12 8s. 5d. for the previous year.

With reference to taxation, the Company has adopted Overseas Trade Corporation status as from April 6, 1958.

Dredge Operation

The dredge worked well, and we have enjoyed an adequate supply of water throughout the whole year. The tailings were levelled off and the experimental planting of trees thereon was continued with encouraging results. We intend to continue our efforts to establish a healthy growth of trees and so reinstate the tailings as far as possible. The labour position remained entirely satisfactory during the year, but we experienced the loss of 271 hours of dredging time on account of interruptions to our power supply, mainly through severe floods which occurred in November, 1957.

The dredge has now worked out more than half of Block 2. Outputs for the current year to date have been rather lower than were expected from the bore results, and it is hoped the returns for the whole year will be more satisfactory. In any event, it certainly seems worth while continuing operations until we can reach Block 5, which is shown by boring to be considerably richer than Blocks 1 to 4. The dredge should reach this block in approximately one year. Block 5 is adjacent to the Fraser River, near the mouth of which such good results were obtained in September, 1940.

Since last I addressed you, a General Election has taken place in New Zealand which has resulted in a change of Government there. Unfortunately, world trade conditions have been very unfavourable generally, and New Zealand has quickly suffered from the adverse economic conditions. Thus it is as yet, perhaps, too early to expect the New Zealand Government to have turned its attention to assisting the mining industry, though doubtless it is keenly aware of the importance of developing the country's mineral resources in general and gold in particular. We still look for a realistic revaluation of gold, in terms of the currencies in which the business of the world is conducted.

TRONOH MINES LTD.

MR. J. H. RICH'S REVIEW

The fifty-sixth annual general meeting of Tronoh Mines, Ltd., was held on October 10 at 73, Cheapside, London, E.C.

Mr. J. H. Rich, Chairman, presided and the following is an extract from his circulated Statement:—

After providing for taxation, there remains a balance of profit for the year ended December 31, 1957, of £766,518. £370,000 has been transferred to General Reserve and £30,000 has been placed to a Reserve against Unquoted Investments. Dividends totalling 2s. per share, less Income Tax, have been paid in respect of the year, and the Directors recommend payment of a final dividend of 6d per share, together with a bonus of 6d. per share less Income Tax, leaving a balance of £335,677 to be carried forward to the current year.

The working profit of Tin Lay, Ltd., our wholly owned subsidiary, is about the same as last year. Owing to the recent purchase by Tronoh Mines Limited of the Puket dredge and leases, it will be possible to utilize the Puket quota for production by the Tin Lay Dredge.

The "teething" troubles experienced by the grab dredge of Aokam Tin Ltd., in which we have a financial stake, have not yet been finally overcome but progress is being made in that respect. One encouraging feature disclosed by the operation is that the ground contains high tin values, thus confirming the boring results.

The Company continues to pursue its policy of prospecting for new areas through the medium of Tromal Prospecting Limited, which is financed by the associated companies of the Tronoh-Malayan Tin Group. Attention has been mainly devoted to testing sea areas off the Siamese coast. No payable area has yet been defined but the results to date are certainly encouraging and fully justify further prospecting.

Mining Operations

As regards our mining operations in Malaya, the severity of restrictions so far as this Company is concerned may be appreciated from the following facts: the monthly output last year averaged 230 tons, whereas for the first two quota periods (6 months) of the current year, the permitted output averaged 118 tons per month. The third quota period will show a slight increase due to grouping with Southern Tronoh, but the fourth quota period will show a decrease owing to the decision to cut production further by 8 per cent. The quota is at present being produced by the three dredges at Kampar section working 5 days a week, this being designed to reduce hardship on the labour force to a minimum.

On August 31 the Federation of Malaya became an independent Sovereign State within the Commonwealth. In my statement last year I expressed my confidence in the future of the country under its changed status and nothing has arisen since then to shake that confidence which has further been strengthened by the words of the Ruler in his speech at the State opening of the Legislative Assembly, when he said: "Malaya is determined to maintain confidence in its financial standing as a field for investors at home and abroad." This encouraging statement has been followed by an announcement that the Federation Government plans in conjunction with other countries in South East Asia to offer business men an international agreement against expropriation and discrimination.

Tin Control

The International Tin Agreement became effective as from December 15, 1957. It is interesting to see the effect it has on the six signatory producing countries. The production of these countries during the year 1957 was 152,236 tons while the total of the allowable export quotas from December 15, 1957, to December 31, 1958, is 93,000 tons, a decrease in production of 59,236 tons. The total world production for 1958 is estimated to be 119,000 tons, made up of 92,000 tons from the signatory countries 12,000 tons from outside producers (other than Russia) and 15,000 tons of exports from Russia; while consumption, excluding Russia and China, is calculated to be 137,000 tons, showing a deficiency of some 18,000 tons. It is surprising that with such a deficiency the Buffer Stock Manager has been called on so heavily to purchase tin to maintain the floor level of £730 per ton. But consumers were aware that the financial resources of the Buffer Stock Manager were limited and that it might not be possible for him to maintain that price level. There was therefore no incentive for them to carry stocks adequate for their requirements and every incentive to them to run down their stocks as rapidly as possible and to work on a hand to mouth basis. The lack of confidence thus produced together with the U.S.A. recession in industrial activity made the position of the Buffer Stock Manager vulnerable.

At this stage considerable quantities of Russian tin were thrown on the market with the result that the Buffer Stock has been compelled at least for the time being to withdraw its support of the floor price level and to allow the unfettered price mechanism of the open market to operate. Though temporarily this may appear unpleasant to producers I believe it will react to their advantage by helping to restore the confidence of consumers. The rise in exports of Russian tin to the free world from 450 tons in 1956 to about 9,000 tons in 1957 and nearly double that rate in 1958 is significant. Imports of Russian tin into the United Kingdom in the second quarter of this year amounted to 2,090 tons compared with 629 tons for the corresponding period of last year. The average three months tin price for the second quarter of 1957 was £767 per ton; the price for the second quarter of the current year was £730 per ton. It seems strange that at the higher tin price only 629 tons were exported compared with 2,090 tons at the lower price. The only explanation to be assumed is that Russia intended to do her utmost to wreck the tin control scheme. Seeing that the major producers of tin are what are known as under-developed countries, it is hard to reconcile Russia's attitude with her much vaunted policies of helping under-developed countries. This furnishes another instance of how little reliance can be placed on her declared intentions. In these circumstances one wonders whether any useful purpose would be served had she accepted in the recent invitation to her to join the International Tin Council. Personally I consider it would be harmful if she were to do so, as it would put her in a position to obtain information to further her own interests at the expense of the industry as a whole.

The source of the Russian tin remains somewhat of a mystery owing to the lack of statistics from that country. Russia is a buyer and seller of tin as well as a producer, but the amount of her production is not known outside. As control schemes incorporating price control are so largely dependent upon accurate statistics the position as regards the source of Russian tin calls for urgent investigation by the International Tin Council if future difficulty is to be avoided. There is always a tendency for outside sources of production to increase under control, as was proved in the last control scheme and full investigation is called for if we are to know just where we are going.

A subject which has been constantly stressed from time to time by the Chamber of Mines and Chairmen of Mining Companies is the need for a more liberal land alienation policy. At the present the Mining industry is suffering from acute land starvation. The seriousness of the position is shown by the fact that at April 30 this year no less than 14 dredges were closed down, not because of tin restriction, but because of the exhaustion of their ore reserves and many more mines are rapidly running out of land.

This Company, in conjunction with its associated companies of the Tronoh-Malayan Tin Group, is sponsoring a scheme for provision of group scholarships for Malayans at the Camborne School of Mines and of maintenance during the courses. We already have three young men studying at the School and two more are just starting. We feel that this scheme will go some way to assist Malayans to fulfil their legitimate aspirations and we are confident that Shareholders will approve the expenditure incurred.

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Publications Received

The quarterly bulletin of the Overseas Geological Surveys, entitled *Overseas Geology and Mineral Resources*, is issued by the Minerals Resources Division of the Surveys. Each volume consists of four parts, with a detailed index and staff lists, and is published by H.M. Stationery Office, price 10s. Volume 7, No. 1, is the result of a detailed investigation involving two months of field work in the Basement System of Kenya, during the summer of 1955. The investigation was made under the auspices of the Colonial Development and Welfare Fund, the Department of Mines and Geology in Nairobi, and the University of Edinburgh. In addition to the reports from geological surveys, the volume contains the following articles: Structural Analysis of the Basement System at Turoka, Kenya, and the Application of a Punched Card System for Indexing Rocks and Minerals. The publication was formerly known as *Colonial Geology and Mineral Resources*, and is primarily intended for the field geologist.

*

A monograph entitled *Tin* has been published by the Commonwealth of Australia, Bureau of Mineral Resources, Geology and Geophysics, as *Mineral Resources of Australia, Summary Report No. 38*. Price 3s. There are no immediate further plans for any large increase in Australian output, it is reported. With operation of the Ravenshoe dredge, an average annual output of about 2,400 to 2,500 tons of tin may be expected. Consumption, on the other hand, is likely to increase from 1957, when it exceeded 3,500 tons, requiring imports of more than 1,000 tons annually. This domestic position suggests an incentive for a vigorous prospecting programme.

Rand & Orange Free State Returns for September

Company	September 1958 Tons (000)	Yield (oz.)	Profit† (£000)	Year ends	Current Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)	Last Financial Year Total to date Tons (000)	Yield (oz.)	Profit† (£000)
Goldfields										
Doornfontein	88	36,511	184·0	J	262	109,427	571·1	256	104,722	556·0
Libanon	98	23,102	54·6	J	294	69,056	164·1	307	68,698	160·6
Luipaards Vlei	70	11,856	5·5	J	210	36,127	15·7	223	39,456	26·9
Rietfontein	20	4,706	10·3	D	196	44,726	113·4	219	50,898	145·7
Robinson	72	14,796	L11·8	D	650	138,241	28·4	681	139,282	86·9
Simmer & Jack	91	17,028	13·7	D	789	150,794	127·3	865	160,046	168·8
Sub Nigel	66	15,988	25·1	J	198	48,097	78·0	198	50,479	84·3
Venterspost	130	32,078	60·6	J	391	96,491	181·8	374	89,426	181·9
Viakfontein	50	17,663	86·0	D	446	157,401	763·1	445	159,591	769·0
Vogels	95	21,095	43·9	D	860	192,486	394·8	889	205,642	654·8
West Drie	80	76,437	626·9	J	240	229,073	1876·3	225	215,302	1867·8
Anglo American										
Brakpan	121	16,131	10·3	D	1,115	148,612	108·7	972	164,272	115·7
Daggas	239	49,106	262·0	D	2,087	433,751	2273·0	2,051	449,049	2458·3
East Daggas	93	15,293	28·4	D	822	136,171	254·0	852	140,987	310·9
F. S. Geduld	74	53,276	380·8	S	803	575,570	3990·7	646	655,204	2240·8
Loraine	72	13,898	L25·1	S	813	154,260	L237·8	757	147,465	L74·5
President Brand	98	72,323	604·2	S	989	736,663	6002·2	765	581,372	4771·5
President Steyn	98	37,706	202·7	S	1,144	471,263	2439·3	1,098	420,626	2385·8
S.A. Lands	91	19,010	55·9	D	804	174,959	475·2	911	171,540	562·2
Springs	130	15,079	9·4	D	1,144	128,929	78·0	1,139	124,441	57·4
Vaal Reefs	78	35,490	202·9	D	647	291,779	1652·2	549	241,763	1434·4
Welkom	91	27,152	79·0	S	1,029	304,530	850·6	1,024	223,357	616·4
Western Holdings	100	56,500	418·4	S	1,169	633,651	5393·0	1,144	239,974	3684·0
West. Reefs Ex.	112	27,451	72·1	D	1,007	238,181	573·4	1,094	238,911	585·6
Central Mining										
Blyvoor	99	65,647	480·6	J	310	200,472	1451·5	316	188,222	1368·2
City Deep	115	23,546	12·4	D	1,172	229,907	90·7	1,335	262,716	148·6
Cons. M.R.	130	20,061	14·5	J	395	61,940	40·7	497	71,027	29·4
Crown	230	35,151	14·9	D	2,069	314,749	139·4	2,150	313,135	3·0
D.Roodepoort	186	33,707	52·1	D	1,636	295,878	458·5	1,647	289,324	462·1
East Rand Prop.	222	55,405	136·3	D	1,909	509,217	1322·0	1,968	504,653	1175·8
Harmony	100	40,002	161·6	J	277	109,529	419·8	260	105,413	546·7
Modder East	130	13,047	2·0	J	412	40,181	5·5	425	304,336	11·0
Rose Deep	47	5,895	L1·2	D	502	65,196	L23·4	447	67,513	3·8
J.C.I.*										
E. Champ d'Or	13	414	L28·0	D	112	2,928	L246·2	109	3,011	L239·1
Freddies Cons.	54	14,809	L45·2	D	471	136,077	L351·1	512	139,194	L148·2
Govt. G.M.A.	63	11,745	0·0	D	562	100,055	8·0	895	151,595	L62·8
Randfontein	22	3,360	5·1	D	252	39,864	45·7	616	102,894	83·9
Union Corporation										
East Geduld	131	40,301	277·5	D	1,151	353,976	2417·2	1,238	380,102	2681·3
Geduld Prop.	75	12,947	17·3	D	707	115,215	94·4	891	141,262	223·1
Grootvlei	200	42,506	216·5	D	1,770	376,800	1918·5	1,758	376,070	1983·9
Marievale	78	20,276	91·1	D	647	169,589	751·6	639	167,823	755·2
St. Helena	125	36,479	198·4	D	1,065	312,490	1578·4	1,045	304,569	1680·3
Van Dyk	78	14,194	21·4	D	687	126,249	223·8	697	120,610	156·0
General Mining										
Buffelsfontein	120	40,560	186·0	J	355	119,616	552·0	334	108,734	630·1
Eliaton	32	7,470	32·7	D	288	66,896	285·4	293	63,208	168·7
E. Roodepoort	30	7,028	24·0	J	90	21,255	73·3	89	20,787	76·0
Stilfontein	126	63,882	420·7	D	1,025	508,073	3283·3	906	405,746	2620·4
W. Rand Cons.	126	18,270	10·9	D	1,249	164,813	129·6	1,281	184,287	137·5
Anglo Transvaal										
Hartebeestfontein	87	47,850	316·7	J	261	142,680	944·3	258	142,760	982·5
N. Klerksdorp	10	1,208	L6·5	D	91	9,890	L69·7	95	11,006	L52·6
Rand Leases	181	26,245	11·7	J	535	78,193	29·0	520	82,143	39·6
Village M.R.	26	4,355	L4·5	J	82	13,871	L0·5	102	16,740	21·7
Virginia O.F.S.	112	29,400	47·7	J	325	84,945	138·4	303	81,210	218·1
Others										
N. Kleinfontein	83	10,703	2·5	D	793	96,141	L27·7	892	104,531	L44·5
Wit. Nigel	18	4,274	6·3	J	54	13,052	19·9	54	12,893	22·8

Gold has been valued at 249s. 11d. (August 249s. 6d.) per oz. fine. L indicates loss. † Working Profit. * Working Profit includes sundry revenue. Table excludes profits from Uranium, Pyrite and Acid, and also production from Uranium divisions at Luipaards Vlei, Randfontein and W. Rand Consolidated.

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This Company is one of the largest in South-East Asia, exporting annually some 2 million tons of iron ore to both Europe and Japan. It is currently engaged in the development planning and final proving of what is to date the largest known, undeveloped iron ore deposit in Malaya. Some 16 to 20 million tons have been proved but further testing and proof is desired.

Two qualified, *single* men are required, minimum of four years' practical experience essential. Geologist must have underground experience, knowledge of diamond drilling and logging from sludge returns. Mining Engineer must have square set timbering experience and knowledge of bad ground conditions. Both men must be practical men, prepared to accept responsibility and additional duties as dictated by circumstances. Location is isolated; the construction camp in the initial stages will be primitive. It is planned to bring this deposit into production within four years. During that time, two small towns, 45 miles of railway, all mine and beneficiating plants installations must be constructed.

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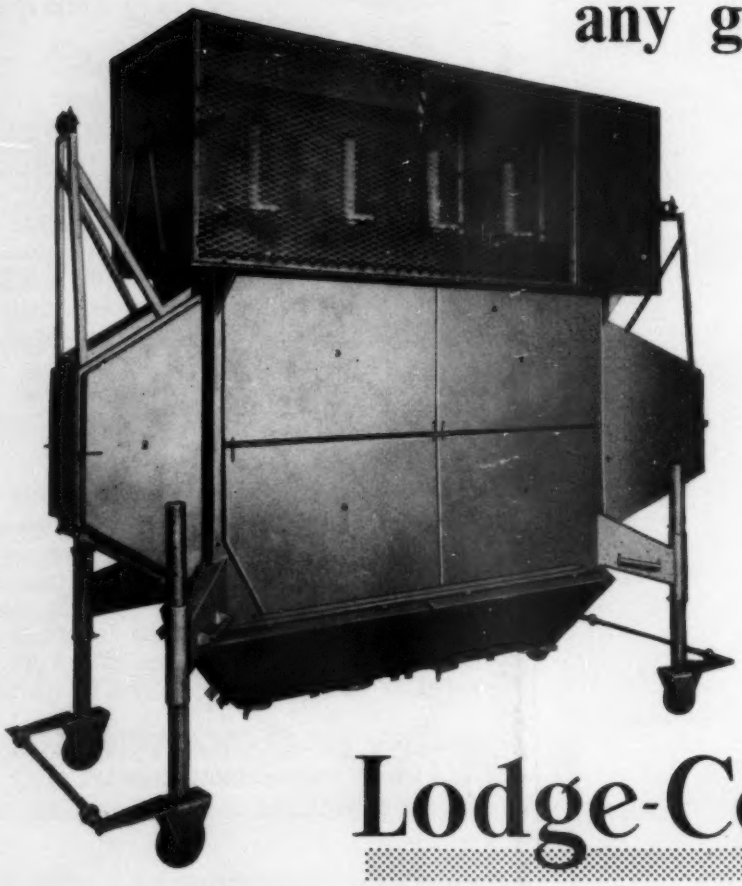

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